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ABSTRACT

Proceedings include: opening remarks (F.J. Willett); a vice-chancellor's needs for management information services (R.W. Russell); the needs of a science dean for information (K.C. Westfold); the perceived needs for management information services from the point of view of a university administrator (R. Marginson); the role of the systems manager (P.R. Masters); the current role of a data processing manager (D.E. Ritchens); external demands for information on universities (P. Karmel, B.R. Williams); information and analysis in higher education planning and decisionmaking in the United States, 1975 (B. Lawrence); survey of management information systems in Australian universities, 1975 (A.W. Findlay); reports of the working groups; and recommendations made by the conference. (MSE)

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AUSTRALIAN VICE-CHANCELLORS' COMMITTEE

CONFERENCE ON MANAGEMENT INFORMATION SERVICES

DECEMBER 1975

AVCC

U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

HE 007 790

AUSTRALIAN VICE-CHANCELLORS' COMMITTEE

CONFERENCE

ON

MANAGEMENT INFORMATION

SERVICES

Dunmore Lang College
Macquarie University

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CONFERENCE ON MANAGEMENT INFORMATION SERVICES

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REPORT TO THE AUSTRALIAN VICE-CHANCELLORS' COMMITTEE

1. *BACKGROUND AND ATTENDANCES*

Following a recommendation from the 1974 Administrative Staff Conference the AVCC agreed to sponsor a conference on Management Information Services. The Conference was arranged by a Committee consisting of Professor F.J. Willett, Professor B.R. Williams, Dr S.A. Rayner and Mr A.W. Findlay, and was held at Dunmore Lang College, Macquarie University, from Saturday 29 November to Monday 1 December 1975. Mr A.W. Findlay acted as Executive Officer, and the AVCC Secretariat assisted with administrative and recording arrangements. The occasion was attended by some 40 participants from all Australian universities, and representatives from colleges of advanced education and the Universities Commission. Speakers at the Conference included Dr Ben Lawrence from the National Center for Higher Education Management Systems, Colorado, Professor P.H. Karmel of the Universities Commission, Professors B.R.Williams, R.W. Russell, K. Westfold and Messrs A.W. Findlay, R.D. Marginson, P. Masters and D. Ritchens. Professor F.J. Willett was Chairman of the Conference.

2. *STRUCTURE AND CONTENT*

The Conference consisted of eight plenary sessions, interspersed with three small-group sessions. Papers had been circulated in advance and speakers commented on them prior to general discussion and questions.

In opening the Conference Professor Willett said he hoped the meeting would achieve a greater appreciation of the needs for management information and the ways available to satisfy them. There was a growing awareness of the importance of developing management information systems in the current climate of accountability of tertiary education institutions. The Conference covered (by means of prepared papers and discussion) a number of specific topics and the following brief summary outlines the principal issues.

(a) Needs for Information as Perceived by a Vice-Chancellor

Professor Russell (Vice-Chancellor, Flinders University) outlined the functions of universities in terms of providing learning experiences, research activities and service to the community. He indicated that the effectiveness of information services would be judged by the support they give in meeting these objectives.

Vice-Chancellors had to sort out their priorities, and management information must help in this task. The costs of providing appropriate information should be weighed against the benefits accruing to the management process.

Discussion covered such aspects as the wide range of people requiring information for decision making, the need for long-term planning, the relative economies of manual and computer-based systems, the value of having hard facts to back up claims for outside funding, and the extent to which the use of quantitative data would create pressure for uniformity.

(b) Needs for Information as Perceived by an Academic Administrator

Professor Westfold (Dean of Science, Monash University), spoke of the range of academic responsibilities which a Dean must assume, and of his need for information of a statistical and academic kind (e.g. enrolments, staff levels, funds, trends in subject choice and employment opportunities, pass and progression rates). He referred to the difficulty facing a Dean in defining precisely what information was needed to improve his performance in day-to-day decisions.

The meeting considered the relative importance of subjective information and quantitative data in reaching academic decisions. It was felt that the central administration should be concerned mainly with 'macro' data, and other areas with 'micro' data. Each institution must work out its own solution to its specific circumstances.

(c) Needs for Information as Perceived by a University Administrator

Mr Marginson (Vice-Principal, Melbourne University) drew attention to the functions of management as planning, execution and control. Administrators had to operate within the policies set by the main university committees and to provide information and advice as required. The management information system had to accommodate a wide diversity of individual needs and styles of administrators, and also had to organise available information in such a way as to assist effective decision making. Top management could be given "summary" information, middle management "condensed" information, and first-level management the "detailed" material.

The Conference received additional details on the attempt by Melbourne University to move to a new decentralised decision-making structure and the value of quantitative information in achieving an agreed financial formula and classification of disciplines for this.

(d) Role of the Systems Manager

Mr Masters (Graduate School of Business Administration, Melbourne University) indicated that the Systems Manager was concerned with three areas - the operation of existing systems, the development of existing systems, and the development of new systems - each requiring different managerial skills. The Systems Manager could greatly assist the user-manager in evaluating possibilities and disadvantages of systems, and in understanding information technology. It appeared that the most effective systems managers were those with a direct responsibility to senior executives and with the freedom to interact with a wide range of users of information.

Mr Ritchens (ADP Unit, Macquarie University) questioned whether Australian universities had yet given a systems manager the responsibility of compiling and maintaining a comprehensive register of potentially useful information. The heavy load placed on data processing units meant that they could not easily develop new

management information systems, and the functions of systems management could become fragmented within the university. There was a need to reconsider the value of such a fragmented approach in the modern situation.

During discussion it was noted that there was a shortage of professionally trained systems analysts and that this problem had been resolved in the USA by establishing NCHEMS as a co-operative effort to plan systems which could be adapted by individual institutions. The possibility of a similar degree of co-operation in Australia was canvassed, in view of the limited resources available to each institution.

(e) The External Demands for Information and the Effect on Universities

Professor Karmel (Chairman, Universities Commission) referred to the various types of external demands (needs of universities for comparative information, need to provide public with information, needs of Government planning). He then discussed the present arrangements and their deficiencies, and likely future needs of the UC for information and analysis of trends in tertiary education. The UC hoped that the future arrangements would be on a co-operative and rationalised basis where possible, to avoid duplication of effort and excessive cost.

Professor Williams (Vice-Chancellor, Sydney University) outlined the wide range of demands from government agencies, industry, the public, politicians and researchers, upon universities, and expressed reservations about the usefulness of some of the information sought. He asserted the importance of greater research by universities into their own methods and processes, and felt the AVCC would assist through its sponsorship of a conference in 1976 on research priorities.

In discussion it was pointed out that universities should be developing more effective measures of their output and the "value added" to students by the educational experience. A catalyst (like

NCHEMS) could help here by defining priorities for research effort and stimulating research work within individual institutions. There would remain a problem of balancing the effort of research against the benefits obtained (through greater public support, etc.).

(f) Ways of Meeting Needs

Dr Lawrence (Director, NCHEMS, WICHE, Colorado) covered the topic "Information and Analysis in Higher Education Planning and Decision Making in the United States - 1975". With the increasing importance of "accountability" in educational institutions, managers had been forced to develop new ways of analysing and evaluating the work of their institutions. Various philosophies had emerged for planning strategies for the future; all had advantages and disadvantages; and all were needed to some degree. Planning always involved both information and imagination, especially in the field of higher education. At NCHEMS it was usual to ask three questions - what is the nature of planning and decision making in higher education, what are the pros and cons of using quantitative information in higher education planning, and what is the role of data analysis/synthesis in planning and decision making? The actual design process used would vary from situation to situation for many reasons (e.g. objective, time available, information, people involved, social and political environment), but the value of relevant information should be stressed.

Dr Lawrence outlined guidelines for an information infra-structure for higher education institutions, and spoke on the costing and cost analysis in higher education, and the role of computers.

During discussion the question of the likely increase in government demands for accountability of tertiary education institutions was considered at length. Other matters were the no-growth budgetting problems, ageing of staff and the consequent unionisation to protect jobs.

(g) The State of the Art in Australian Universities

Mr Findlay (Deputy Registrar, Macquarie University) reported on the results of a survey conducted among the universities prior to the Conference. He said that most universities were using computers for many processes, but that little use was being made of management science or operational research techniques.

Demands from outside agencies could force universities to begin cost-benefit assessments of various academic programs, and reviews of teaching methods, teaching load, support staffing levels and space utilisation. Some overseas techniques could be very valuable in meeting these new requirements. Additional effort might be directed towards co-operation among institutions in developing information systems. In discussion the meeting considered the ways in which management might obtain better training in more flexible analytical techniques for handling data and making forecasts.

3. WORKING GROUP DISCUSSIONS

The Conference divided into three working groups to discuss the needs for information, the structure needed to meet these needs, how institutions might collaborate more, and the possible roles of the AVCC in helping this co-operation. Reports of the working groups were presented to the plenary group and appear on pages 255-267.

4. RECOMMENDATIONS

The Conference resolved to recommend as follows:

(a) That universities are under increasing pressure (both internal and external) to demonstrate their capacity for effective management. This leads to demands for efficient operational data systems (for student records, staff, etc.) and effective management and planning control information which stems from the operational data.

(b) The costs of each university individually finding workable solutions are likely to be unacceptably high and there would be considerable value in the co-operative development and sharing of existing systems.

(c) Therefore the AVCC should urgently explore ways of improving management information services taking into account the desirability of using specialist staff from the universities as required for different aspects of the investigation. This exploration may call for the establishment of an AVCC Steering Committee.

(d) That the universities accept responsibility for committing resources of staff and funds actively to the development of improved management information systems, and that work to this end might be co-ordinated by small specialist working groups linked with the Steering Committee.

(e) That the AVCC initiate co-operative efforts to extend the work of the Joint Committee on Computerisation of University Statistics to encompass the development of data element dictionaries for the principal management information areas (students, staff, finance, facilities, libraries).

(f) That the AVCC consider establishing a centre for the exchange of information systems details among the universities (and colleges).

(g) That consideration be given to the possibility of seeking overseas financial support for these proposals (e.g. from US Foundations).

5. CONCLUSION

The meeting was found to be valuable in highlighting the areas of need within the Australian university system for greater co-ordination and co-operation in the development of management information services. The informal contacts among delegates added considerably to the formal sessions in enabling the sharing of experiences and prospects. On behalf of the Conference I wish to thank the AVCC for its initiative in arranging the meeting.

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F.J. Willett
Chairman

OPENING REMARKS BY THE CHAIRMAN FOR THE CONFERENCE, PROFESSOR F.J. WILLETT, VICE-CHANCELLOR, GRIFFITH UNIVERSITY

Following a recommendation from the Administrative Staff Conference in 1974 the Australian Vice-Chancellors' Committee agreed that a conference on management information services should be held. A small organising committee was appointed consisting of myself as convenor together with Professor B.R. Williams, Dr S.A. Rayner and Mr A.W. Findlay. The detailed organisation for the conference was handled by Mr Findlay, as executive officer.

The basic need that brings us together is a view that, in a changing context, particularly a changing context of accountability outside and inside the university, there is a need for planned and more sophisticated information systems. Also there are many explorations going on in individual institutions, of ways in which information needs could be met; it is probable that there is some duplication of work. It is therefore worthwhile to pause to see what sorts of common ideas we have about needs and to pool the information about the exploratory work that is being done in various universities. Expected outcomes would be that we have a general appreciation as to how we and our colleagues feel about needs and that an inventory be developed of the work being done or proposed. I hope we will move to outlines of possible developments both within individual institutions and between institutions.

This was the first of the AVCC converences to be conducted after the establishment of the Association of Principals of Colleges of Advanced Education and we took the opportunity to extend an invitation through that organisation to our colleagues in the colleges of advanced education to be with us. We also have with us Dr Ben Lawrence from the National Center for Higher Education Management Systems. Many people here will have met and talked with Dr Lawrence as he visited some universities before the conference; visits intended to give him an opportunity to ascertain our present practices.

What we plan to do, as you will see from the program, is to ask the authors of the papers to introduce them and, at the end of each session, it is hoped that there will be general discussion inside this group as a whole, and not just question and answer sessions to the speaker. We will also hold discussions in three working groups, reporting to a plenary session.

I would now ask Professor Russell to introduce the first paper.

A VICE-CHANCELLOR'S NEEDS FOR MANAGEMENT INFORMATION SERVICES

Professor R.W. Russell, Vice-Chancellor,
The Flinders University of South Australia

> The advance of technology has enabled
> man to communicate at twice the speed
> of sound while he still acts at half
> the speed of sense.

During a career in universities of three continents I have never noticed a lack of flow along their channels of communication. What I have often observed is the frequency with which much of this flow has failed to influence actions taken, has contributed to "noise" in the channels and has failed to influence its receivers. I have often suspected that this is because all concerned were talking and no one was listening. My present concern is to look at the needs - the requirements - for management information services as I perceive them in attempting to meet my responsibilities as a Vice-Chancellor.

Information about whom and what?

The variety of information needed by the senior executive officer of a university today is very substantial. He is *not* responsible for some ivory tower separated from, but loved by, the general community. Universities are institutions created by society, supported by society, responsible to society and, presumably, making significant contributions to society.

The Vice-Chancellor must be prepared to relate to several *communities external* to his own institution: the local, state and national political communities; the community which provides the immediate physical environs of his institution; the community of other educational institutions; the community of societies with interests in academic and professional matters; the social community of parents and friends and some who are not so friendly; the community of employers who, hopefully, will be interested in the university's graduates; Convocation, the community of those graduates

with special powers under the university's charter. You recognise, of course, that I use "community" in a very broad sense.

The Vice-Chancellor must also have information which will enable him to relate to the variety of *"communities" within* his university. Clark Kerr, as President of the vast University of California, described what he called the "multiversity" of the twentieth century:

> "The multiversity is an inconsistent institution. It is not one community but several - the community of the undergraduate and the community of the graduate; the community of the humanist, the community of the social scientist, and the community of the scientist; the communities of the professional schools; the community of the non-academic personnel; the community of the administrators... A community.., should have common interest; in the multiversity they are quite varied, even conflicting."

Clearly the Vice-Chancellor must have the information necessary to make decisions and to take actions relating to any or all of these groups as the occasion may demand. Because there are many of them and because social groupings are so dynamic in their cohesiveness and in their search for change the possible needs for particular information must be anticipated, captured, stored and capable of being rapidly retrieved - but more about the characteristics of information services later. Before examining desirable characteristics it is important to agree, at least in general terms, about the objectives to be achieved by the services.

Information for what purposes?

Traditionally universities have existed as organisations to create outputs which may be included in three major categories:

1. To produce learning experiences for its students;
2. To provide opportunities for research and other creative activities for its academic staff; and,

3. To put its capabilities to work in service to the general community of which it is a member.

A Vice-Chancellor must have information required for decision-making upon which actions to achieve his university's goals may be based. Much has been written about decision-making, the steps in which have been listed recently as follows (Radford, 1973):

"1. Perception and formulation of the problem;
2. Construction of a model of the decision process;
3. Establishment of quantitative measures of variables involved in the process;
4. Definition of strategies or alternative courses of action;
5. Establishment of criteria for choice between courses of action;
6. Resolution or decision."

Clearly information services can have significant influences on the confidence with which decisions toward achieving a university's goals are made. Earlier I answered the question, "Information About Whom and What?", by describing the many "communities" with which a university interacts. In considering the purposes of information services within a university we must appreciate the potentially overwhelming magnitude of an "ideal" system capable of providing any bit of desirable information about any one or more of these groups within the time constraints imposed on much of the institution's decision-making. Information services can only be selective. Services designed to serve the needs of management must be concerned with the pattern of decision-making in the university. Today's trends toward involving in its management persons from all units within the university's organisation presents quite different requirements for the acquisition and dissemination of information than did - in some instances still does - a pattern of decision-making in which responsibility and authority and accountability are vested in one or a few "managers".

In its final evaluation the effectiveness of a university's information services will be judged by the support they give to success in meeting objectives in terms of outputs which the university's organisation was created to provide.

Information systems

Against this broad background I wish now to consider the more specific needs of a Vice-Chancellor for some form of information system.

A number of years ago I had the pleasure of knowing a person who was particularly insightful in his perceptions of "The Human Use of Human Beings", as one of his books is entitled. Professor Norbert Wiener in another of his texts, *Cybernetics*, comments that "...the community extends only so far as there extends an effective transmission of information." By "effective" Wiener was referring to certain basic processes essential to the viability of all organisations: the processes of "capturing" and of storing information; of the transmission of information from one point in an organisation to another; of the use of information about past and present circumstances to determine future actions, actions to ensure achievement of the organisation's goals in a changing environment; and, processes to ensure that the information flowing is appropriate to decision making and is in a form that can be understood - hence, used - by managers.

I find it helpful to conceptualise management information services required by such processes as comprised of five major components. These are features of a university's organisation which are involved in the acquisition, processing, retention, transmission and presentation of information needed by management to carry out its responsibilities.

One of these components is concerned primarily with the information processing required to support the routine functions of the university and is sometimes referred to as the *"administrative and operational"*

services. Its functions include maintenance of personnel records and other employee services, payroll and accounts, purchasing and procurement, maintenance of inventories and the like.

Another component is involved in providing *"management reporting"* services to those at all levels within the university who are responsible for day-to-day decision-making tasks.

To ensure that the quality and quantity of information needed by decision makers is available is the responsibility of a third basic component. An *"information management" system* serves the functions of what is referred to in the jargon as "capturing and updating information for the institution's common data base." It generates reports as required by management and services needs for information from the wide variety of "communities" within and external to the university.

I have already spoken of a *"common data base"*, which, quite obviously, is central to the management information services as a whole. In most universities common data bases have grown from small beginnings involving a small handful of faithful clerks hidden in some dark and dusty den to operations which put to use today's highly sophisticated computer technology.

A fifth component of management information services provides what I view as the essential capability of obtaining information on demand, in a form which usually has not been routinely structured in advance. Such *"information retrieval" services* supplement the management reporting services described above.

You may prefer to organise your own perceptions of a university's management information services in other terms. But I believe that whatever conceptual model you may use will include all the functions I have described.

There is need to discuss one other major feature of management information services: the communication networks which provide for the "two-way" flow of information among components.

Analyses of communications systems have found it useful to refer to five basic components: source, transmitter, channel, receiver, destination. The services we are considering involve means by which the flow of information from source to destination may be facilitated. These means include the selection of sources from which information is to be obtained and the encoding of that information for entry into the communication channel; the nature and capacity of the channel; and the capability at the destination of decoding the information transmitted. Such information nets may range from relatively simple face-to-face encounters to the kinds of complex computer storage and retrieval systems which are now within the technological capabilities of even relatively small management units. In all information systems the possibility exists that errors may occur; mistakes made in encoding or decoding messages or disturbances in a channel increase the probability of error - introduce "noise" into the system. To make this simplified model more realistic it is useful to point to the fact that any formal management information system must be viewed as being supplemented by information communication, often unplanned and occurring accidentally. He who plays golf with the senior executive on Saturdays may well have a more significant role in entering information into an institution's overall system - or taking it out - than more senior colleagues in the management structure, a situation which tends to exist more often in the relatively unconstrained climate of universities than in other institutions.

Basic to the concept of management information services, therefore, is the requirement that systems with the characteristics I have just described must be available to connect a wide variety of sources and destinations. Information must travel in both directions along all individual channels and there must be multiple channels to serve multiple purposes.

"Noise" in the system

A moment ago I mentioned the introduction of "noise" into the

information system. This is one of two particular matters which I wish to comment upon a bit more fully.

Noise results from the introduction into a system of unrelated, often fragmentary messages which are devoid of meaning within the context of the expected flow of information. As noise increases, ability to receive information decreases. Under noisy conditions distinctions which would otherwise be clearly perceived become blurred and useless. All channels of communication are noisy. Therefore all channels are subject to mistakes and, unfortunately, one of the characteristics of noise is its unpredictability.

One of the needs in my workaday world is to minimise such errors. This can be done by asking the source to repeat the message or by confirming it with another receiver. In both cases redundancy is involved - and redundancy is a cost item. It also places constraints upon the capacity of communication channels to carry different information.

My question here may be put thus: What are the rules by which errors in a management information system can be minimised, while maximising its effectiveness in the amount of information it can carry?

Information "load"

Another problem which concerns me when I study management information systems and their possible effects on those involved in them is the matter of information "load". Information flows through the communication nets with which I am linked at a very rapid rate. Redundancy to minimise errors adds to the load which, on some occasions, exceeds my capacity to handle the information.

In her paper at a 1975 international seminar on "The Role of New Communications Systems" Professor Marianne Frankenhaeuser of the University of Stockholm made the observation that a highly developed

nervous system provides humans with a wide repertoire of behaviours among which they can make deliberate choices in shaping their life conditions. This capability has enabled them to transform their social as well as physical environments at an accelerating rate. She went on to state:

> "... the structure and the size of the human brain have remained essentially the same over some forty thousand years. Thus, we are faced with two seemingly incompatible phenomena: the stand-still of genetic evolution and the accelerating pace of social evolution ... This raises the question of man's adaptability. How far can the tolerance of this old biological equipment be stretched? What heppens if the limits are exceeded?"

The general response to information overload is a decrease of ability to select relevant information. Differential responding to available information is impaired. Feelings of tension and emotion develop. All these are reactions to stress which may seriously affect judgment and decision making. Information overload can increase the discrepancy between efforts to absorb and to process the information provided by management information services.

Vice-Chancellors are among those who are subjected to the stresses of information overload. They are constantly challenged to sort out their priorities and to decide how to allocate their capabilities. How can management information services be designed and operated to assist them in this basic task?

Characteristics of information services

Obviously it is not good enough to assume a *laissez-faire* attitude that the information required by a Vice-Chancellor will, somehow, arrive at, when and where he needs it without the careful creation and support of systematic information services.

I once had a friend whose charming personality resulted in his rapid rise to a position as head of a university but whose basic

principle of management was: "fly by the seat of your pants". If his colleagues had not constantly bailed him out, he would soon have retired with a rather red backside. Information for management can be the output of an *ad hoc* series of frenzied questions or an organised and continuously ongoing activity. Far too frequently, information is generated under chaotic last-minute circumstances and resulting actions reflect the lack of care and foresight.

Carefully-planned and operated management information services are essential supports for a Vice-Chancellor. What are their necessary characteristics? I list those which I, myself, seek. Management information services must:

1. Provide the breadth and depth of support required for informed decision-making.
2. Encompass both formal and informal components.
3. Reduce the time required to answer questions involved in decision-making and other actions.
4. Make more clearly explicit questions underlying the formulation of plans and policies.
5. Encompass means of capturing relevant information from sources both within the university and its external communities.
6. Provide communication channels from sources of information to the decision-making centres and from the latter to those responsible for implementing decisions.
7. Have facilities for aggregating and collating information in order to convert it to a form readily comprehensible to those involved in the university's various activities.
8. Minimise major risks in long-range planning.
9. Provide flexibility in planning, enabling regular reviews to take account of recent experience data.
10. Make possible effective, integrated academic planning and institutional budgetting.
11. Encourage close rapport between planning and operations.

12. Include storage facilities for information not immediately required or which may be used more than once.
13. Provide accurate and relevant information for regular evaluation of the university's progress toward its goals.
14. Shift the burden of work of key people from data gathering and processing to the uses of data for decision-making and other actions.

Costs and benefits

Whether information is organised or obtained *ad hoc* it imposes costs on an institution's resources. Because these resources are never sufficient to do everything that everyone wishes, decisions must always be made about their allocation - and we are playing a zero-sums game. To allocate resources for information services means not providing support for some other worthy project. Therefore, a Vice-Chancellor has need to consider the cost-benefits of whatever services he introduces. Basically his decision to implement a management information system is dependent upon the extent to which the improved quality, better flow and greater accessibility of information is valuable to himself and to his university.

The costs of a management information service may be divided into two major components: development costs and operating costs. The former arise from:

1. Resources required for design and implementation.
2. Capital investment in hardware or software required.
3. Costs involved in testing or converting to the services.

My own experience leads me to the conclusion that it is advantageous for development costs to be budgeted and paid for from a central account, thus placing control of funds alongside the initiative for introducing or modifying the services.

The major amount of the operating costs of a management information service arise from the administrative and operational components

to which I referred earlier. These components support functions and operations required by the university's responsibilities and, therefore, are integral parts of the overall costs of these functions and operations. Budgetting for these charges usually involves both managers of the administrative or academic units involved and those in central management who are concerned with the use of the system to serve the university as a whole.

Whenever I have moved to a new institution in some management role I have always asked myself the question: How much energy and resources do I wish to put into the design and implementation of an information system? Obviously some form of system already exists, but it may have grown like Topsie - haphazardly - and may not serve its purposes efficiently under current circumstances. Review of the existing system is essential, if for no other purpose than to learn how to use it. But thorough evaluation can, by comparing costs with the kinds of benefits I listed earlier under "Characteristics of Information Services", provide a base for decisions about improving the usefulness of the present services - or, indeed, of starting afresh in the development of a new system.

A final observation

I have discussed what I consider to be the needs of a Vice-Chancellor for management information services in terms of the outputs of a university, of the "communities" with which a university must interact in achieving its goals, and of the requirements which I believe may reasonably be placed upon an information system. There are other ways in which my comments could have been structured. My purpose has been to initiate discussion - not to constrain it by providing authoritative answers. Undoubtedly my colleagues on this part of our Conference will describe their perceptions of needs for management information services in different terms. I look forward to joining them and you in the discussion to follow.

REFERENCES

Recognition of the importance to all organisation, large or small, of carefully planned management information services has, during recent years, stimulated a number of conferences, symposia and other attempts to consider the subject systematically. The references given below include reports about some of these efforts, although there is no attempt to be all inclusive. Those listed have provided background for the present paper and may be of interest to anyone wishing to examine the subject in greater detail than our present Conference may allow.

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SUMMARY OF REMARKS MADE IN PRESENTATION

Professor Russell drew attention to the principal sections of his paper. He indicated that a Vice-Chancellor must have information to make decisions and to take actions relating to the various communities within and outside the university. Information is needed for decision-making related to the achievement of the objectives of a university. Two problems for the Vice-Chancellor were to recognise "misinformation" or "noise" in his information system and to cope with "information overload". Some of the present trends in university organisation tended to contribute to overload and noise in the system. These trends included greater participation in the decision-making processes and the tendency for issues to be brought up through the channels to the highest bodies. The Vice-Chancellor needs to consider how much energy and resources should be put into the design and implementation of an information system.

Professor Russell indicated that he considered more information might be needed for decision making to allocate more limited resources. Also, even though circumstances can change rapidly, such as the change in the financial arrangements for tertiary institutions in 1976, long range planning was still important. He indicated that Flinders University was at present developing a system of academic planning to cover three triennia and a fiscal plan to cover two. It would be a rolling planning system updated each year to take advantage of the most recent experiences.

SUMMARY OF THE MAIN ISSUES RAISED IN DISCUSSION

A question was raised as to whether more administration was required as growth slowed down or whether there was only a change in direction. Professor Russell considered that although initial set up would be greater, there should be some economies of scale during the period of growth. However, decisions would be harder to make as the degrees of flexibility decreased and there was less opportunity to make up for misjudgments.

Dr Lawrence considered that if institutions in U.S.A. had been more careful in their planning during the time of expansion some of the present problems associated with the levelling off of enrolments might have been avoided. The experience in U.S.A. highlighted the importance of information from external sources, particularly demographic data.

In answer to a question about the decision-making powers of a Vice-Chancellor, Professor Russell stated that he considered the main power of a Vice-Chancellor was persuasion as there were few actions he could take under the Act or Statutes under which he functioned without consultation, and often authority, mainly from the university council or one of its committees.

One of the problems recognised with the wider range of persons participating in decision-making on committees was the need to provide information for these people who may change frequently. Some of these persons were often too busy to brief themselves fully on the information supplied.

Professor Russell considered that it was important for the Vice-Chancellor to specify what he required from an information system. It was recognised that some computer-based systems had imposed constraints and it was important to introduce as much flexibility as possible to allow for changing requirements. Hopefully data from a management information system would assist

in resource allocation but it should also assist in the evaluation of whether the resources were effectively utilised. Information systems can only assist the person who has the authority and responsibility for decisions but they cannot make decisions.

Dr Lawrence considered that management information systems would improve the management of an institution by only about 5%, mainly because most of the resources were fixed. However, it was found in U.S.A. that the output from the management information system gave a greater credibility to an institution in arguing its case for support from public or private funding agencies. The supply of information to department chairmen had also tended to lead to a more equitable distribution of resources. However, the availability of quantitative information may have had detrimental trends towards a homogenisation of the three sectors of higher education in U.S.A. Some public funding sources had seriously questioned tenure because of the large continuing commitment. Some persons thought that a similar development would occur in Australia leading to averaging and the elimination of centres of excellence. Strong arguments would be needed to maintain diversity within an institution and between institutions.

THE NEEDS OF A SCIENCE DEAN FOR INFORMATION

Professor K.C. Westfold,
Dean of the Faculty of Science, Monash University

1. Universities all over the world are diverse institutions. Even within Australia, which has had only two centuries to develop its transplanted culture, our universities exhibit markedly different characteristics. Here we have the 'old' universities, one in each State, and all founded before World War I when the States were able to behave in a more sovereign manner than they can today; the 'intermediate' universities founded after World War II and 'before Murray'; and the 'new' universities founded after 1957 in the wake of the Murray Report, which led to the revolutionary institution of Commonwealth financing of all Australian universities through the agency of the Universities Commission.

I speak as a dean of the Faculty of Science of the first of the new universities. Having said that, I need hardly add that what we do in Monash University is certainly not the same as in any other Australian university. I could not even say that it is similar to what is done in any of the other new universities. These have, for the most part, consciously sought to differentiate themselves from the institutions that preceded them, by adopting novel forms of degree structure, organisation, and governance, specifically designed to achieve the goals that they have set themselves.

Monash has had a rapid growth since it opened its doors to its first undergraduate students at the beginning of 1961. During that time it has grown from a gross enrolment of 347 to a figure of 13,249 in 1975. In Universities Commission terms we have already become a 'mature' university. In the beginning our non-professional Faculties of Arts and Science resisted the proposition that we should have full-time deans. However, the work required to keep abreast of the problems raised in coping with an increasing intake of 1000 new students per annum proved overwhelming, and with reluctance both

Arts and Science agreed in 1964 to join the other faculties and appoint full-time deans. Since that time the practice of appointing full-time deans has continued in all Monash faculties.

I have set all this down so that people from other universities can put my remarks into perspective and perhaps appreciate better that what we do in my faculty at Monash is as much a product of our particular experience (often in meeting ad hoc situations), as the result of conscious design.

In order to provide a frame of reference for what follows I quote (a) from the Conditions of Appointment that I accepted in April 1965 and (b) two paragraphs from a memorandum issued by the Vice-Chancellor to staff in the following February.

(a)

MONASH UNIVERSITY
DEAN OF THE FACULTY OF SCIENCE
CONDITIONS OF APPOINTMENT

DUTIES

The dean, who will also become a Professor on appointment, shall be a full-time officer of the University and shall be required:

1. To advise the Council on the future planning and development of the Faculty of Science. This will involve a consideration of the broad policy to be adopted regarding the nature of courses to be offered. It will also involve advice on the appointment of professors and other members of staff. The Dean's function will be to help encourage, plan and mediate within his faculty and within the University as a whole, but not to command.
2. To facilitate and co-ordinate the teaching and research within the Faculty in accordance with the Statutes and Regulations of the University and the direction of Council to whom he shall be responsible through the Vice-Chancellor.

3. To take decisions after he has had the corporate advice of Chairmen of Departments.

4. To accept such other responsibilities as the Vice-Chancellor may delegate to him.

He will be encouraged to undertake limited teaching or research, or both if he wishes.

(b) FULL-TIME DEANS: RESPONSIBILITIES AND DUTIES

3. The first responsibility of Deans is as Chairmen of their faculties: this involves them in carrying out the academic policy of the faculty and being generally responsible for such matters as student selection, A.E.S. admissions, course structure and regulations, examinations policy and assessment and so on.

4. The second responsibility is for the broad financial and business policy of their faculties; this may involve taking decisions on such matters as the sub-division of the faculty budget, especially if consultation with the interested parties has failed to produce agreement.

It should be clear from the above that the management functions of a dean at Monash are exercised, not by virtue of any authority attached to his office, but by encouragement, mutual persuasion, and the promotion of consensus within the academic community that comprises his faculty. He has then to represent the faculty interest to the university and to the community at large. At this level he must be prepared to forsake a partisan faculty role in favour of the interests of the university as a whole, and then be ready to justify his actions to his colleagues within the faculty.

To be effective in his role as manager of the affairs of his faculty a dean must be able to draw on a fund of relevant data, both for his immediate purposes and in pursuit of the long-term goals set for the faculty.

2. DATA FOR A DEAN

Monash University was born at a time when the potentiality of the computer for data processing had become evident. It was therefore a foregone conclusion that we should process our data by computer and so provide ready access for the production of specific lists or reports, and at the same time enable any necessary calculations to be made.

In thinking of management information in our context it is easy to confine one's attention to the sort of data that can be held in computer files - so-called 'hard' data. It is certainly important to have these readily available to meet requests from bodies such as the Australian Statistician or the Universities Commission. Probably of more significance to a dean, however, is the 'soft' sort of data that cannot, or has not, been codified. He needs to keep these in mind as reference material against which he makes many of the judgments required of him.

3. ACADEMIC GOALS

The academic goals of a faculty are implicit in the curriculum it provides for the students who seek the degree for which the faculty is responsible. The nature of the subjects offered, the variety that a student is permitted to take, the standards that he must reach in order to qualify for a pass or higher grade, all in some measure determine the qualities of the graduate who is finally let loose in the community. In turn, what are seen to be the needs and interests of the community influence the syllabuses of the subjects taught and the regulations governing the award of the degree.

Standing,as he does, outside the departments of his faculty, the full-time dean is in a favourable position to suggest new initiatives and help mould them as they pass through faculty committees eventually to emerge as viable proposals. Other changes arise within departments, reaching faculty level only if they survive the process of critical discussion in the initiating departments. In many cases members of the

faculty consult the dean at an early stage in order to obtain a view on how an idea might 'run' in other departments within the faculty, and in the university at large. The dean's ability to judge the worth of a proposal and to offer suggestions and advice on the presentation of a case are important factors in encouraging flexibility of outlook within his faculty. To this end he needs to know what has happened in the past, what is currently happening in various areas of his faculty and outside it, and the various plans that have been devised for the future.

At a more mundane level the dean must acquire some familiarity with the material requirements of the departments of his faculty in relation both to research and teaching. This information is basic to his recurring task of allocating resources - staff (academic and non-academic) and funds for maintenance and equipment. It is also needed for allocating and planning accommodation for the departments of the faculty.

4. STUDENT STATISTICS AND DERIVED PARAMETERS

Enrolments

The basic parameters available to a dean are statistics of undergraduate-student enrolments by subjects, and graduate-student enrolments by departments. In one way or another these determine the allocation of teaching resources to each department, viz.,

teaching staff
technical and clerical staff
maintenance
equipment
building space.

Parameters such as student load, student/staff ratio, maintenance per EFTS (or WSU), equipment per EFTS (or WSU), area per staff place, area per student place, can now be calculated (if they have not already been specified in order to determine any of the allocations). These

are necessary for comparisons, within the faculty and with other faculties and other universities.

Forecasts based on past experience and expected trends are incorporated into what have been triennial submissions to the Universities Commission. As each year rolls on these forecasts need to be revised. Reasons should be sought for gross discrepancies between actual and forecast numbers (e.g. the swing from physical to biological sciences) so that appropriate corrective measures can be taken, particularly by altering the numbers of students admitted to a faculty and imposing quotas on subjects whose facilities are saturated.

Because departmental academic staff are highly specialised and for the most part enjoy security of tenure it is not possible in a mature university for the system to respond to these trends quickly by re-allocating staff from areas of low demand to areas of high demand; in a Science faculty the inertia is further increased by the lack of transferability of specially designed laboratory space and specialised equipment.

In order better to predict these trends a dean needs to be apprised of changes of fashion in students' choice of subjects in the universities of North America and the United Kingdom, since these seem to precede similar trends in Australia. The relation between employment opportunities and popularity of subjects is not yet clear. For example, I suspect that students at present choosing biological subjects for their major studies have not been greatly concerned at the limited availability of jobs for biological scientists as such. So far (but not for too much longer) there has been a practically inexhaustible sink of employment available to those who do not land either a biologist's job or any other scientist's job for which they have qualifications. With the relatively easy acquisition of a teaching qualification, such graduates have readily secured appointments as science teachers in a State Education Department or in the Independent School system.

I suspect that most science students choose to major in certain subjects because they believe them to be intrinsically interesting, a reason which I cannot but applaud. In this situation more reliable information on trends is likely to come from subject choices at the secondary-school level. Here I draw attention to the Secondary-Tertiary Education Planning Project at present being undertaken by the Careers and Appointments Office and Computer Centre at Monash University, jointly with the State Education Department, with the aim of identifying changes in student preferences at school as an aid to better educational planning.

Each year subject enrolments fluctuate for several weeks until students settle the subjects of their choice. By 30 April, the date at which figures become official for Australian statistical purposes, undergraduate enrolments are fairly steady. Graduate students, however, are notoriously reluctant to lodge enrolment forms and considerable pressure has to be applied if the official figures are to be a proper record of the student population.

After 30 April there is a continual, if small, attrition rate due to undergraduates' withdrawing from their courses, usually with the intention of deferring for the remainder of the year. As a result the number entering for the annual examinations (or assessment) in a subject may be less than the official enrolment in that subject.

Pass Rates and Progression Rates

The examination statistics of a university provide some measure of the efficacy of its teaching - in relation to the standards set by the individual examiners. Pass rates are normally based on the numbers entering the annual examinations. If the pass rate in a subject with a large enrolment suffers a sudden change, this should be explicable.

To this end the examiners should have relevant examination statistics available at the time that their results are being

assembled for submission to the Board of Examiners. They can then be prepared to defend their judgments if they should later be called into question. In our own faculty it has been customary for the examiners in the large first-year subjects, before they submit their final gradings, to hold a 'histogram' meeting at which each compares his tentative distribution of gradings with those of other subjects, and in relation to the distributions of previous years.

I have already mentioned the attrition in enrolments during the course of the academic year. In recent years the number withdrawing seems to be growing. Reasons range from being insufficiently prepared academically, through physical illness, to personal inability to cope with the stresses of university life, particularly with the need to devise one's own study pattern. I believe that the numbers withdrawing are now large enough to justify analysis of the various reasons offered, in the hope that appropriate responses can be made.

Again, the statistics of progression rates, from first-year entry through to graduation, provide some measure of the efficiency of the process of communicating knowledge and those scholastic qualities that the university expects of its graduates. My own view is that it should not be a matter of great concern if a proportion of students takes one or possibly two years longer than the minimum time to reach graduation level. I should prefer, however, that this were achieved by students' choosing to enter for no more subjects than they can comfortably pass than by failing to achieve a pass level in all of the normal load of subjects for that year.

5. CONTROL OF STAFFING BUDGET

At Monash the dean has the responsibility of allocating the staff positions available to his faculty, approving appointments made to those positions, and controlling the expenditure of funds available for casual staffing and the savings that accrue to any unfilled positions, in accordance with rules laid down by the Committee of Deans. For this purpose, if his departments are to achieve optimum

value from the available staffing resources, he needs up-to-date records of occupation of all positions, the expected dates of arrival of new staff members, commitments in relation to casual staffing, and the balance of free funds available in the faculty budget.

C. CONTROL OF MAINTENANCE AND EQUIPMENT FUNDS

Again, at Monash, maintenance and equipment funds derived from the university's recurrent and capital grants are under the control of the dean. Once the allocation has been made, control is exercised by the chairman of the department, in laboratory departments through his laboratory manager. The flow of expenditure is by no means uniform and varies from department to department. The laboratory manager keeps a careful watch on his ordering of various items, in relation to when and how much will be needed, discounts available for larger quantities, when accounts will fall due for payment, and the like. He needs up-to-date records of actual expenditure, committed funds and associated delivery dates, and stocks held - information which he maintains in his own office.

The life of a laboratory manager is further complicated by having to keep track of transactions relating to any number of research grants made to individual members of his department. At Monash the dean of the faculty is not involved with the administration of these grants, beyond having to approve the level of appointment of any staff member whose salary is met from these funds.

I believe that it is unlikely that a central system could ever cope satisfactorily with the task of providing each laboratory manager with all the information he requires, up-to-date and in the particular form appropriate to his needs. Nevertheless, returns from the central finance branch giving details of orders, commitments, payments, uncommitted funds, and free funds, on a monthly basis, are of considerable value for checking against a department's domestic records.

For a dean such returns provide a check on how the funds he has allocated are being expended, and, in relation to normal patterns for that department, provide him with some standard against which he can judge a request for supplementary funds from any contingency funds that he may have at his disposal.

7. CONCLUSION

It should be evident from this laborious account that I have not been comfortable in responding to the request that I should discuss the information requirements of a dean. I should have found it easier to talk about academic issues, or about specific procedures that we have adopted in our faculty, than to attempt an analysis of all the information that I draw on when carrying out my decanal duties, and how it could be better provided - to say nothing of what information I should be demanding in order to do my job better. Perhaps it would have been of more value to my faculty if I had been asked to face these questions at the beginning rather than at the end of my career as dean.

SUMMARY OF REMARKS MADE IN PRESENTATION

Professor Westfold indicated that he was conscious that each university was an individual institution and the management system developed would depend on its history. He outlined the role of the full-time Deans of Faculties at Monash University. He considered that many academic decisions needed to be made largely on the basis of "soft" data such as the Dean's knowledge of the relative quality of staff in different departments.

Whilst agreeing with the desirability of forecasting Professor Westfold drew attention to the problems of responding quickly to changes in demand such as the swing from the physical to the biological sciences. A large proportion of staff were on tenure and in technical faculties equipment and facilities were not readily transferable.

Professor Westfold referred to the decentralisation system at Monash University and indicated that certain records needed to be maintained in faculties.

SUMMARY OF THE MAIN ISSUES RAISED IN DISCUSSION

There was discussion on the ways of relating "soft" data such as intuitive, speculative or qualitative judgments and "hard" quantitative data to reach a decision. It was noted that personal prejudice could predominate unless sufficient attention was given to quantitative data.

Comment was made on the duplication of record-keeping in most institutions. Mr Tate indicated that discussions between his accounting staff and laboratory managers at Monash University had suggested that the only solution to duplicating records of maintenance expenditure was to have an "on line" system. However, at this stage the cost did not appear to be justifiable. It was suggested that the central administration should be primarily concerned with "macro" information whilst departments should be more involved with "micro" information.

THE PERCEIVED NEEDS FOR MANAGEMENT INFORMATION SERVICES FROM THE POINT OF VIEW OF A UNIVERSITY ADMINISTRATOR

R. Marginson, Vice-Principal, University of Melbourne

Introduction

When I was invited to present a paper on this topic the conference convenor, Professor Willett, indicated that "management" was to be used in a wide sense of being "the process of defining the academic and other goals of the university and facilitating the effective attainment of these goals".

In this session I am assuming that the perceived needs of a Vice-Chancellor by Professor Russell and an academic administrator by Professor Cochrane will cover adequately the needs to serve the process of defining the academic and other goals of the university, and so I will mainly be concentrating on the management information services needed to facilitate the effective attainment of those goals from the point of view of a university administrator.

Basic functions of management

It can be said that the three basic functions of management are planning, execution and control. Attachment I[1] sets out in diagramatic form the relationship of these functions and the broad information characteristics needed to support them. Planning deals with the university's objectives and policy covering various time periods up to at least 10 years hence, execution involves carrying out the existing plans in the present and control involves monitoring our execution by various feedback techniques to determine that we are proceeding in accordance with plans and standards.

The role of the administration

Administrators individually and collectively have an important role to play in each of these functions and at varying levels within the hierarchical structure of the university community but it is

important that they operate within the policies set by the main university committees and in accord with agreed principles and procedures.

There needs to be an appreciation of the distinction between policy and implementation.

Fielden and Lockwood[2] have said that it is the duty of an administration to provide information and advice to committees and academic officers, in addition to providing factual information about ranges of choices and their alternative implications. The administration also has a duty to make suggestions on policies, to examine critically the effects of policies, to question the effectiveness of decisions, and it has some range of choice about the methods of implementing decisions.

Diversity of perceived needs

Within a university the management functions are widely dispersed, especially with the increasing incidence of "participatory democracy" in the decision-making process, and each of those who participate has his own perception of the needs for information.

Whether or not the needs are satisfied is a most important question. This was the subject of a recent study by Wyatt and Zeckhauser[3] which found that generally the needs of administrators were not being satisfied as effectively as they might and in fact there was only a very tenuous relationship between university administrators and management information.

This no doubt is largely because individual administrators differ in style, preferences and background, and so to be efficient and effective a "system" must not only provide administrators with the data necessary for their management and control responsibilities, it must be flexible enough to adapt to their differing needs, attitudes and priorities.

Other major reasons for dissatisfaction may be that the administrator's expectations of his needs being satisfied were initially inflated; alternatively in the design, development and implementation of systems he gave his support to the project but not his involvement, and so the designers did not really know what his needs were.

Administrators may be classified based on information needs".

- Those that believe in wading through piles of computer print-outs coming weekly, monthly and all manner of time periods.
- Those with closed minds, that do not wish to be disturbed by facts.
- Those who panic up to a deadline seeking an answer to just one more question before that 2 o'clock meeting.
- Finally, there is the one who likes to play his cards very close to the chest. All he wants is a terminal on his desk to access the data base without the interference of the programmers, systems analysts and information specialists who, he feels, never really give him what he wants anyway.

The problem with these styles is that the same manager can play any of the roles, and others, at different times based on the environment as he sees it and the influence of internal factors.

Data or information

Within a university there is a vast reservoir of information covering the full span of activities, but in many instances this may represent no more than large blobs of seemingly unrelated and unindexed facts. It is essential that this data be:

(i) systematised in such a way that it can be transformed into meaningful and timely information; and

(ii) structured to provide a reliable quantitative foundation upon which decisions can be based and informed qualitative judgments reached.

As seen in Attachment I planning information transcends organisational lines, and this itself can be a factor inhibiting the development of this information. This is especially so if there exists a proprietary attitude in some of the functional departments (e.g. accounts, buildings, staffing, student records) towards non-confidential information which they have developed. This "sole owner" attitude can result in the formation of individual systems within the departments bringing duplication of efforts, unnecessary expense, and, ultimately, conflict.

If the centralised recording and reporting systems are not responsive enough to the needs of academic administrators, duplicate systems and information will be established in academic departments. Apart from being the type of duplication on which management consultants grow fat, this data is likely to not be easily reconcilable with "official" university information. In consequence management's action is handicapped and there is a further loss of effort and capacity in achieving reconciliation.

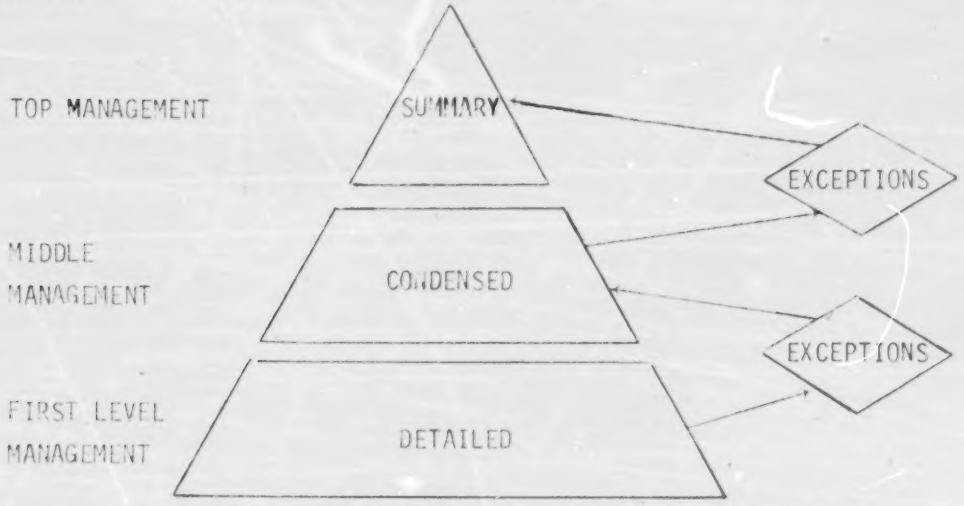
Reporting requirements

Merely increasing the volume of data going forward does not in itself necessarily lead to more informed decisions. In fact voluminous data, much of which may be irrelevant to the particular problem to be acted upon, may completely hide the significant data and therefore be of no real use.

The essentials of a particular problem needs full understanding. A decision is then needed on the level to which the report should be aimed, before deciding what, when and how much information is to be conveyed or reported. Finally then the package can be put into the most appropriate format.

Only the essential information should be presented, as an effective report is the one which is brief, analysed and accurate. Effective presentation should incorporate such techniques as graphs (bar charts, pie charts, simple and semi-logarithmic graphs), ratios, indices and percentages. These often readily provide evidence of inferences, implications and trends.

The amount of detail needed regularly at top levels is less than that needed at lower or middle management levels. This results in a pyramid of report information, with exceptional items (both positive and negative) automatically selected from each level of report and included in the information normally reported to the next higher level of management.



The department or first level may want an alpha listing by name and status of all full-time and part-time academic staff members, the faculty may want a count for each department of academic staff by status, and the university budget committee may want the full-time equivalent academic staff for each faculty compared with budget.

Effective reporting, by necessity, involves the inter-relationship of data and the crossing of functional boundaries.

Interpreters

In the study referred to earlier conducted by Wyatt and Zeckhauser they found that few executives in higher education had the time or inclination to get directly involved in coping with internal information deficiencies. Instead they frequently used "interpreters" as their primary information source who served as a middleman between an executive and the quantitative data. In other words they translate a gaggle of hard numbers into a useful and usable form for top-level analysis[5].

One of the conclusions arising out of the study was that it appears that the quality and skills of the interpreters are the most important single determinant of the quality of an institution's management information system[6].

Information can come from a variety of sources and in a variety of forms. It can be physical, financial, quantitative, qualitative, regular or ad hoc, but the information by itself cannot control or initiate the activities of individuals or the organisation. It needs to be acted upon by that most important ingredient: people.

Management information cannot do management's job, but it is an essential ingredient in the process. Those administrators who have valid information as a basis for making decisions, and who use this in conjunction with their own personal experience and value judgments, are bound to be more effective than those who do not.

Inter-university comparisons

An important managerial tool for university managers, especially from the planning aspect, is the development and use of both inter-university and intra-university comparisons.

What is the purpose and expected benefits to be obtained from inter-university comparisons?

Universities are very expensive institutions that are placing ever increasing and competing demands on society. As they invariably never receive the share of resources they think appropriate, it is essential for them to have optimal plans to ensure maximum possible utilisation of their limited resources in the achievement of academic objectives. It is here that inter-university comparisons have an important role. They provide one of the few available yardsticks for the measurement of the "efficiency" and "characteristics" of particular segments of its own operations against that of other universities or groups of universities. They have to be employed with care and understanding, they may also need considerable restructuring to produce comparisons that are meaningful.

University managers need this type of data as a basis for comparison and as one way of gauging the effectiveness of their own efforts. Comparisons will identify variations; these then need to be subjected to further investigation to determine, if possible, reasons for difference. After this the question can be asked whether action should be taken. If the variation is due to a conscious policy decision, or a historical difference in practice and the reasons in these cases are still seen as valid, then action may not need to be taken, in that particular area.

Knowing how your university stands when compared with others reduces the element of the unknown, reduces the risk and provides some guide for future planning in a very difficult planning environment. To gain the maximum benefit from comparison figures a university should aim to integrate the resultant information into its decision-making process as one of its planning tools.

At the University of Melbourne we have recently introduced formula budgetting, and the parameters of the formula were largely derived from a detailed analysis of the departmental costs of 1973 expenditure of all universities. This cannot be enlarged upon in a brief paper but can be reviewed in discussion. Suffice to say that, as would be

anticipated, the formula application is not absolute, that there is inevitably a subjective element in its use, that a formula does not solve the fundamental question of distribution of the total resources across broad areas, and finally that a substantial discretionary fund is held by the Central Budgets Committee to deal with emerging difficulties and special please.

Specific information needs

I would now like to move on to the specific perceived needs of management information services from the point of view of a university administrator.

The majority of administrators are concerned with the execution and control functions. It is therefore necessary for information to be developed that will enable reporting on various types and levels of activity and measure performance with plans made previously.

A listing of specific quantitative information needs, which are by no means exhaustive, is set out in Attachment 2. This covers students, staff, library, finance, equipment and space, buildings and grounds.

These are the perceived needs for management information services from the point of view of a university administrator. They are a shopping list of what should ideally be available, rather than the battery of data currently available at this stage in Melbourne. We have made substantial advances in the generation of management information in all areas save staffing and financial data. This is the focus of our current work which is being carried out by a Steering Group chaired by a Controller of Management Information, a position created at the senior level for this purpose with a function conspectus of about five years.

As indicated at the beginning of this paper the emphasis has been on those management information services needed to facilitate the

effective attainment of the academic and other goals of the university. In addition to the list of quantitative information, administrators must of course be actively aware of the academic and other goals of the university, details of its current plans and policies. They must also have an appreciation and understanding of the policies and attitudes of various related institutions, organisations and individuals that may have an impact on the university in the long and short term. This strays towards the area of recruitment and training. Although a truism, one cannot escape the fact, however, that the basic resource in a university is still its staff.

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[1] Daniel, Ronald D., "Management Information Crisis" in Peter P. Shoderbeck (ed.), *Management Systems*, John Wiley and Sons Inc., 1967, p.56.

[2] Fielden, J. and Lockwood, G., *Planning and Management in Universities*, Chatto & Windus Ltd, London, 1973, Chapter 10.

[3] Wyatt, J.B. and Zeckhauser, Sally, *University Executives and Management Information: A Tenuous Relationship*, Harvard University, February 1975.

[4] Burgstaller, H.A. and Forsyth, J.D., "The Key-Result Approach to Management Information", *Management Advisor*, May-June 1973.

[5] Wyatt, Zeckhauser, *University Executives..., op cit.*, pp.36-37.

[6] *ibid.*, p.41.

ATTACHMENT I.

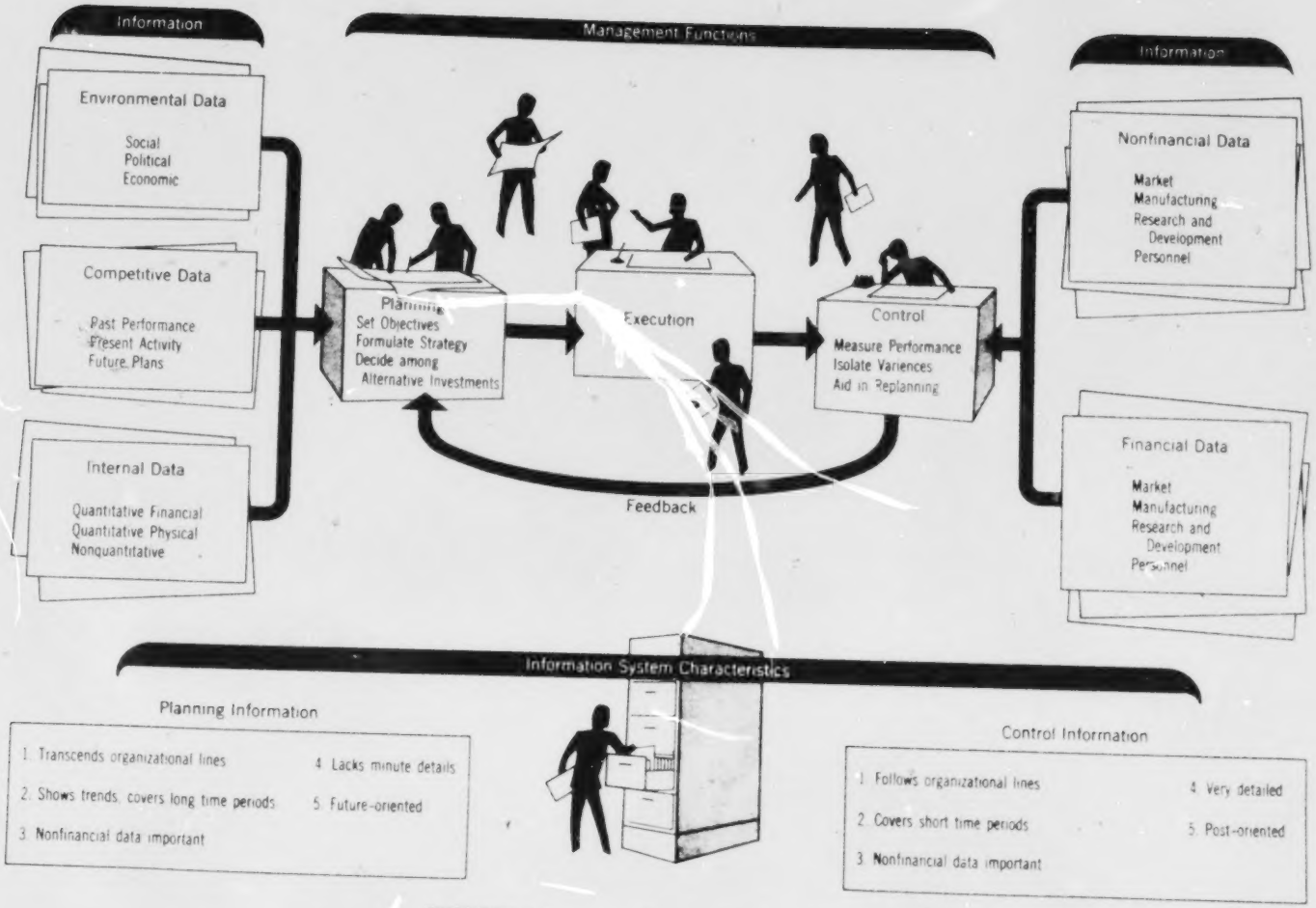

EXHIBIT I. Anatomy of Management Information.

ATTACHMENT 2.

SPECIFIC QUANTITATIVE INFORMATION NEEDS

STUDENTS:

No. of new course applications made, offered and accepted X course X selection score.

Historical educational/socio-economic characteristics related to subsequent academic performance.

Pattern of overall cumulative enrolments X week, and compared with estimates.

Headcount X course year w/i* course w/i level X attendance X sex.

List of all students; alphabetic, numeric.

Discrete lists of students in alphabetic and/or numeric order; showing name, number, course, address.

Subject listings and headcounts.

Class size analysis.

Cumulative historical/current record of each student.

Term and Home Residence analysis of all and new students.

Age distribution analysis.

Course withdrawal analysis.

Student Load X OTHD, HD, TOTAL X Faculty/Department, Actual vs Estimate.

Student Load X course w/i subject w/i level w/i department w/i faculty.

Student Load Matrix, analysis to show load going to and being received from each faculty/department.

Normal student's formal contact hours X course year w/i course.

Projections of Student Load and course enrolments.

Subject and examination clash lists and timetables.

Examination results

- distribution of grades X number X % X subject w/i year w/i department w/i faculty (degree enrolled faculty and/or teaching department faculty)
- pass rates X course year w/i course.

Graduation data

- courses completed X course X number of years taken to complete
- graduation rates of student intakes X graduated in minimum time, minimum time + 1 etc.
- number and type of degrees conferred and/or completed.

Industry/occupation analysis of graduates.

* w/i = within

STAFF:

Appointments/Resignations for the period X number X grade and/or salary level X sex w/i department/faculty.

Highest qualification X location of new and/or all academic staff X number X grade w/i department w/i faculty.

List of all staff; alphabetic, numeric.

Discrete lists of staff showing name, department, address, etc.

Staff X number and/or listing X tenure status X grade.

Age, grade and sex distribution analysis.

Average full-time equivalent salaries X grade w/i department/faculty

Staff establishment register X position showing position number, tenure status, budget provision, grade, reversion level, fund source; occupant's name, number, date of appointment, annual salary, grade, sex.

Vacancy listings.

Leave accrual analysis X time and current value X study, sick, annual and long service.

Staff teaching and other load data: Faculty Activity Analysis.

Full-time equivalent staff X department.

Student Staff Ratio.

Ratios of Technical/Administrative staff to full-time equivalent academic staff and/or student load.

LIBRARY:

Loans X type X library.

Entrance counts.

Photocopy counts.

Cataloguing X type

Acquisitions: Commitment and expenditure compared with budget X subject area and/or department.

Binding X number X value X type X library.

FINANCE:

Projection of salary expenditure X position w/i department.

Comparison of actual salary expenditure and commitments with annual budget and year to date.

Comparison of planned and unplanned salary savings with budget allowance.

Analysis of promotions, reversions and rises.

Overtime analysis.

Expenditure and commitments X category of expense X budget, actual X year to date and annual X uncommitted balances X department.

Details of transactions for period (month) X department.

Consolidated income and expenditure statements.

Expenditure X category X $'000 X % X $/WSU.

Departmental expenditure X category X % X $/WSU X rank order.

Lists of bequests, gifts and grants X income, expenditure, commitment, free balance X donor.

Listing of investments X fund, type, cost, market value, rate of return.

Transaction report for period.

Current liquidity report and cash flow projections.

Current status of debtors/creditors.

Age and value analysis of debtors and creditors.

Student fees and fines outstanding.

Capital projects X grant and income received, expenditure to date and anticipated for subsequent quarter.

Capital expenditure and commitments X category of expense X budget.

Analysis of current and projected expenditure due to inflation and reconciliation with supplementation.

EQUIPMENT:

Equipment register.

Equipment X type X number X value X location X department.

Age analysis of equipment.

SPACE/BUILDINGS/GROUNDS:

Master plan.

Space standards X category X department type.

Rooms inventory showing room, location, size, services, stations and type of use.

Utilisation analysis.

Potential space requirements X department

Usable area X department w/i discipline group per WSU and EAS.

Comparative operating and maintenance cost analysis, especially compared with outside contract rates.

Traffic/Parking volumes.

Indices of costs.

There also needs to be information related to community plans for the development of the area or the environment in which the University exists.

* * * * * *

During the course of the Conference Mr Marginson made available supplementary material expanding on the material contained in this attachment. In particular a detailed analysis of management information data and its uses in the buildings and site area was distributed.

SUMMARY OF REMARKS MADE IN PRESENTATION

Mr Marginson drew attention to the diversity of needs for information, the dichotomy between administration and faculty and the importance of administrative styles. Particular administrative styles imposed constraints on information systems and the senior person needed to have an overview of the system to avoid information being produced that is not required and not used. He referred to the use of "middlemen" to interpret available data for senior management.

Mr Marginson indicated that at the University of Melbourne they are moving towards decentralisation of financial authority and decision making on the use of resources. The University had moved to a new formula-based divisional budgetting system related to allocating funds rather than positions. The parameters in the budgetting formula were largely derived from detailed analysis of department costs of all universities in 1973 with adjustments to take account of differences at the University of Melbourne.

The basic formula for determining costs for each department was a straight line with a constant 'A' independent of the number of students and a component 'B' proportional to the number of weighted student units (WSU). All disciplines were divided into five groups with, in addition, a faculty administration group. The values for the component 'B' reflected the different work loads on teaching and teaching methods with each of the discipline groups. The formula served as a guide to the distribution of the teaching and research component of the total university budget. The existing distribution of funds between the teaching and research, academic services, library, administration, etc. was not changed. In the first year of operation it was agreed to move 20% towards the distribution of funds suggested by the formula and to hold back about 1% of the total recurrent income to deal with emergency difficulties. The faculties were then asked to use their subjective judgments to distribute funds between departments.

SUMMARY OF THE MAIN ISSUES RAISED IN DISCUSSION

Attention was drawn to the difficulties in making inter-university comparisons without a common classification structure such as the one developed by NCHEMS. Mr Marginson indicated that it was recognised that some disciplines at the University of Melbourne did differ from similar disciplines in other universities and so he doubted whether the formula derived at Melbourne would be applicable to another institution. Reference was made to the danger that a formula would tend to reduce all disciplines to the same level and eliminate "centres of excellence". Mr Marginson considered that there had been value in having an accepted fundamental basis for distribution before introducing subjective judgments. He expected the transition stage would continue and the inter-university comparison would be done again in about three years' time. As a result the values of the parameters in the formula could change.

Further investigation was seen to be required to ascertain the justification for some areas being more expensive than others. In this connection interaction between staff in allied disciplines could be valuable.

Mr Marginson indicated that analysis had shown how expensive small grouping can be and that, after considering the academic aspects, some of the smaller groupings had been eliminated.

THE ROLE OF THE SYSTEMS MANAGER

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1. Information as a resource

Men, money, materials and machines (or facilities) have always been considered the four basic resources of any organisation, and the basic factors with which management is concerned in achieving organisational objectives. Each of these has a body of knowledge surrounding it and a set of principles devoted to its management. A fifth resource, now recognised as equally important, is information.

The effective use of information has become as important as the effective use of any other resource. Indeed, the extent to which the classic resources are well managed is increasingly becoming a function of how well information is managed. Thus, it becomes clear that since information must be treated as a vital resource, then the organisation-wide acquisition, protection, dissemination and utilisation of this vital resource must be properly managed and controlled.

This is information management and in it the Systems Manager has a primary role and responsibility. A close parallel can be drawn between the work of the Systems Manager and that of any other resource manager. The Financial Controller, for example, has similar responsibilities with regard to the acquisition, protection, dissemination and utilisation of money. The similarity goes ever beyond the areas of responsibility to the nature of the responsibility in each area. Thus, both Systems Manager and Financial Controller have executive authority in relation to acquisition, protection and dissemination and advisory authority in relation to utilisation.

2. Areas of operation for the Systems Manager

The Systems Manager is concerned with three areas of operation:

- the operation of existing systems
- the development of existing systems
- the development of new systems.

Each of these requires different managerial skills and calls for different abilities in the staff working for him.

The operation of existing systems is clearly a matter of establishing appropriate routines to ensure that data is collected, checked for accuracy and processed in accordance with a suitable timetable and at an effective level of cost. The Systems Manager's responsibilities may or may not include the operation of a computer centre. That is immaterial. His main responsibility must be to ensure that the "acquisition, protection and dissemination" is carried out effectively.

Developing existing systems (sometimes called "maintenance") has two aspects - remedying defects and "fine tuning". These may occur either in relation to information technology or in relation to information needs. In the former case, the developments will normally be generated by the Systems Manager himself (or his staff) but in the latter case they will be generated by the user.

Information is effective management information only to the extent to which the manager (the user) needs or wants it; and it is significant to him only in terms of its relation to his accumulation of the relevant knowledge and plans and to his personal responsibility. Thus, the passing of time may change information needs, even within the one system, and flexible response on the part of the Systems Manager, within cost limits, is required.

The development of new systems requires a different approach again. Here the role of the Systems Manager is twofold - to contribute to the definition of information requirements and to manage the

development of the system to the point at which it becomes operational. Both of these are discussed in more detail below.

3. The development of new systems

New systems fall basically into one of three categories:

- data processing systems such as payroll or the maintenance of an asset register;
- control systems such as the preparation of monthly comparisons of expenditure and budget;
- planning systems such as financial models used to evaluate alternative strategies.

Only the latter two are decision systems and therefore only the latter two strictly qualify as management information systems. Yet in the majority of cases the data to be used in the decision systems originates in the data processing systems and its effective organisation into a data bank from which the decision information required can be extracted is vital. The three types of system must therefore be considered as different aspects of total information management.

The first responsibility of the Systems Manager in this area is to seek out opportunities for providing more effective information. To leave this entirely to the user-manager is to abrogate one of his functions. Effectiveness may derive from greater accuracy, greater promptness, selective (exception) reporting, lower cost, greater capacity to examine numerous alternatives and so on.

In conjunction with the user, the Systems Manager must then evaluate the feasibility of the new development not only in economic and technological terms, but also in its operation - will the managers who are to receive the improved information use it and make better decisions? Many management information systems have foundered on this rock. Economic feasibility depends of course on an

evaluation of benefits - a very difficult problem in relation to planning and control systems. The user-manager is the only one who can estimate the benefit but the Systems Manager can provide considerable assistance. In a similar manner the user-manager must determine what information he needs and how he wants it presented; the Systems Manager can and must act as a catalyst to stimulate thinking on the basis of his general information systems knowledge.

4. Education

The role of the Systems Manager in helping the user to develop his information needs suggests an even broader responsibility in relation to education. Experience shows that where user-managers ignore new information systems, it is because they have insufficient understanding of the information technology and as a consequence are suspicious and resentful of change. The Systems Manager - as Information Resource Manager - must ensure that this does not happen, no matter what level in the organisation is involved.

5. Audit

Every system that is introduced is based on some expectation of costs and benefits. Improvement in the estimation of costs and benefits can only come about if there is a formal evaluation after the system has been operating for some time. The Systems Manager should initiate this for himself as part of the overall management of information in exactly the same way as the Financial Controller does in relation to the use of funds.

6. Conclusion

The comments above have made no reference to programmers or systems analysts, visual display units or computer networks, or any of the tools which the Systems Manager may use. Defining the tools does not define the role. They are a consequence of it. Understanding the role of the Systems Manager is essential if user-managers are to contribute their part to the management of the information resource.

PAPER PRESENTED

In his printed paper, in the section describing the basic information processes essential to the viability of all organisations, Roger Russell quoted to us from Norbert Wiener's book "*CYBERNETICS*". Cybernetics is, of course, the study of control and communications in systems of all kinds and is therefore the study of information. The word comes from the greek "kubernetes" which means "steersman". The latin word is "gubernator" from which we derive governor and government. Thus is the link established between information and management.

In November 1972 another great cybernetician, Stafford Beer, was invited to Santiago by President Allende of Chile to lead a team with a formidable task - how should cybernetics be used in the exercise of national government? In the following twenty months a cybernetic system was designed and implemented. The basic problem to be overcome was the relationship between information flow and rate of change. In his book "*Platform for Change*", Stafford Beer writes:

> *"If things are changing very fast, then government needs instantaneous information. If its information is out of date, then its decisions are worse than irrelevant. It is a familiar notion that economic movements operate in cycles. Then out-of-date information is not merely "late"; it is precisely incorrect, because it represents some cyclical trend that has since been superseded, but this is not recognised."*

Those of you who have read the publications of the Club of Rome - "*Limits to Growth*" and "*Mankind at the Turning Point*" will recognise the situation in which the act of control creates the instability which it is trying to remove. In the Chilean situation - as in every management situation - high speed information flow was required, combined with effective variety reduction to generate meaningful real-time indices of

every aspect of the national economy. This was achieved with a communications network, a central computer system and a suite of computer programs called CYBERSTRIDE. CYBERSTRIDE takes as input the actual figures collected every day from all over the country - production, labour, raw materials and so on; computes the various indices and uses a forecasting procedure to distinguish genuine trends from random fluctuations. Where corrective action is required, CYBERSTRIDE provides signals to the manager concerned - and to no one else.

CYBERSTRIDE goes even further. It deals with the situation where the manager fails to act effectively. When the computer sends an exception report to a manager, at whatever level that manager may be, it computes for the message an acceptable delay time which is a function of both possible reaction time and the importance of the situation. If the computer fails to detect an improvement within the allotted time it breaks with autonomy and notifies the next higher level of the system (as well as telling the manager responsible) - and this process continues up to the President himself, if necessary.

As Stafford Beer points out, this is no different from the neuro-cybernetic control in our own bodies - signals of special distress are automatically fed through to whatever level is necessary in order to preserve the viability of the system as a whole.

By now you will be wondering what all this has to do with the Role of the Systems Manager and the paper which I wrote for distribution prior to the Conference. So let us leave Stafford Beer for the moment - I shall come back to him later on.

In my paper - the one which you have in front of you - I have described the basic areas in which the Systems Manager operates; I have described his responsibility for the operation and development of existing systems and for the development and implementation of new ones; and I have referred, as have all three speakers yesterday afternoon, to the differences between data processing systems, planning systems and control systems. I have also referred briefly to the role of the Systems

Manager in the education of users and in the systems audit. I shall expand on one or two of these areas but I am sure you will all agree that, in general, they are not matters in dispute. We should all know about them but they tell us nothing of the role of the systems manager in the real world.

The real world is a very different place from the neat and tidy one which my paper implies. It is the world where information is not only a resource, but power; the world where withholding information is power also; the world where the systems manager may have to fight entrenched conservatism; the world where individual managers may be more interested in protecting their own empires than in contributing to the good of the organisation as a whole and where, as a consequence, even the suggestion that there should be a cost-benefit study prior to the introduction of an organisation-wide information system could be sufficient to ensure that lack of co-operation prevents the system from ever being successfully implemented.

The history of computers and information systems has been studded with disappointments, with the sort of situation which can lead a Chairman of Directors to state in his Annual Report when trying to explain away a substantial decrease in profit:-

> *"Unfortunately a lack of appreciation of the complexities associated with the changeover, by all concerned, created a most difficult and costly situation ... and whereas it was expected that the computer would save costs, it has had the reverse effect to a major extent."*

But these were not technological complexities - it was the impact of the system on the organisation and on the people in the organisation which had been underestimated.

So I want to talk about the role of the systems manager in the real world and about the conditions that must be met for his responsibilities to be effectively carried out.

Back, then, to Stafford Beer.

In twenty months Stafford Beer succeeded in implementing, in a real-life situation, the total management-information-system concept dreamed of by managers for the last ten years - and he did it, not for a small firm, but for a whole country. He succeeded, not only because he was competent and had access to extensive high quality resources, but because of two other things. He had the complete support of the Chief Executive of the organisation - President Allende - and he had direct access to him.

In 1963, McKinsey and Co., the American management consultants studied the differences between those companies who were successful in their use of computers, and those who were not.
Out of 27 companies studies, 9 were considered to be above average in their results. All of these companies were organised in such a way that the Systems Manager (or in their terms the Corporate Computer Executive) reported either directly to the Chief Executive or to one level below. In the less successful companies over 80% reported at levels below the Chief Executive.

In 1967 a similar study was carried out in Australia by P.A. Management Consultants. Twenty companies were divided into the 10 more successful and the 10 less successful (for obvious political reasons there were no failures!). The results were remarkably similar.

Why should the reporting level of the Systems Manager be important? There are, I think, two reasons:-

- firstly, the nearer the Systems Manager is to the Chief Executive, the more direct support will his activities receive; the greater the direct support, the more acceptable will the Systems Manager's proposals be to others in the organisation - remember we are dealing with the real world.
- secondly, whereas initial systems are likely to be in a single functional area such as salaries, later systems - particularly a management information system - can cut across functional and

departmental boundaries. The systems manager who is organisationally part of one functional area is severely restricted in his ability to work with others - restricted both by inter-functional rivalries and by the impossibility of resolving differences of opinion between functions from within one of them. He must be outside the functions and departments which his systems serve, reporting directly to the executive who can resolve those differences, differences which cover priorities and allocation of resources in addition to aspects of information flow between departments and the rights to different kinds of information.

A further condition to be met for success is the competence of the Systems Manager himself. Most organisations, in their first move into computers, appoint a man with high technical competence, and for their first system this is a wise move. But technical competence becomes increasingly less important as the work of the systems group expands. The management of the systems group itself comes to require high managerial competence but, rather more importantly, as systems expand across departmental boundaries high managerial competence is required for an effective interface with other managers. Managing is getting things done through other people, not just through your subordinates. When I persuade my Professor to do something, I am managing him.

Gibson and Nolan in an article in the January-February 1974 issue of Harvard Business Review suggested that there are four stages in the growth of a computer systems group.

Stage 1 - initiation - is usually concerned with a single application area such as payroll where the use of a computer is apparently justified on the basis of cost savings.

Stage 2 - expansion - sees a rapid growth of systems in an uncoordinated manner and is accompanied by spectacular increases in cost. The greater the success of Stage 1 the more rapid will be the "take off" in Stage 2.

Stage 3 - formalisation - comes with the sudden realisation that perhaps insufficient attention has been paid to cost/benefit analysis during Stage 2 and that as a consequence no one now knows whether or not the computer effort is justified. Controls are tightened, resources restricted, priorities reviewed. It is not unusual at this stage for the technically oriented Systems Manager appointed for Stage 1 to be replaced.

Stage 4 - maturity - follows. Co-ordinated systems of planning and control are developed aimed at improving the effectiveness of the organisation as a whole. The systems group is set up as a separate functional area, data bases are developed using a common data dictionary - and so on.

Stage 4 cannot be achieved without high managerial competence, a competence that will build effective bridges between systems personnel and users and will ensure that systems projects are managed as projects with all that that entails.

Project management is quite different from the management of an ongoing activity. A project has a defined starting point, a clear-cut objective, a desirable finishing date and specific resource pattern. These four are completely inter-dependent. A change in the desired finishing date will change the resource pattern. If the resource pattern cannot be changed then the finishing date cannot be changed without changing the objective. All of this is subject, of course, to the problems of forecasting, and is familiar enough to those who have had experience of construction projects.

Computer projects, however, have a particular aspect seldom met in other projects. A building can be used even if the outside painting is incomplete or bad weather has held up the landscaping of surrounding areas. This conference could still have been held even if there had been a postal strike and the distribution of papers had been prevented. But there are no options open with a computer system - either it works or it doesn't. And although shortcuts can be taken - and frequently are -

even the shortcuts have to work. The effective systems manager is the one who succeeds in getting his clients - the users - to understand this point and as a consequence to involve themselves in achieving project completion by the desired date.

The systems manager's managerial competence is required in another way also. One of the main problems of designing an information system is to determine what information is required. Information is required to help managers make decisions. It must be related to the decisions they make and only they, in the long run, can decide what information can help them. But, and it is a very large but, if you ask a manager what information he would like to have, he will not, in general, be able to see past the information he is already getting. If the systems manager allows himself to be satisfied either with what is already happening or - as sometimes occurs - with a demand for, say, a highly detailed weekly analysis of expenses which he knows no manager can possibly digest, then he is failing in his job. He, or his analysts, must be able to act as consultants and to advise on information requirements. One of my M.B.A. students produced for me just recently page 776 of a report which was produced twice weekly for a finance company showing all time-payment accounts which were more than one day overdue. It's not that the information is incorrect, it's just that the mind boggles at how effective it is. Would it not be better to use the computer to select the forty or fifty accounts which were in the worst condition, according to some management criteria, and to list these only? In this way the manager responsible can spend his time taking appropriate action rather than thumbing through 1000 pages of computer printout.

Similarly the Systems Manager should be able to recognise when the reports he is producing are no longer being used.

Three kinds of reports can be envisaged in a management information system

- exception reports, identifying where action is required
- supporting detail reports where additional information is required before a decision can be made

- background information reports for occasional reference.

The first should be produced regularly, i.e. weekly or whenever a situation is outside control limits. The second are required on demand. The third are required at relatively long intervals.

Exception, demand and summary reports - the basic components of a management information system.

We should of course recognise that if information is power, then the Systems Manager has power through his ability to provide reports to individuals and at times of his choosing, and to answer demands for information. Organisation structure and information flow are closely linked. To change the information flow is to change the organisation structure. To starve someone of information is to exclude them from the organisation.

In Stafford Beer's information system action reports were only sent to the manager responsible until such time as he failed to take action. Then, and only then, was the next level in the hierarchy involved. But if a System Manager wants to discomfort or unseat a particular individual this is easily done by sending the performance reports on the individual's section to his superior before the individual himself receives them. The Departmental Head - or perhaps even the Vice-Chancellor - receives reports of overspending in a laboratory before the Laboratory Manager has time to analyse the situation, decide what corrective action is required and report upwards what he proposes to do to regain control. An excellent recipe for de-motivation - and a reason for everyone to maintain their own duplicate system.

The Systems Manager may have other involvements in organisational change. Diagram 1 represents a systems view of the organisation - and I am now using the word system to mean an assembly of inter-dependent entities which transforms inputs into outputs in accordance with some goal. In manufacturing the inputs are labour, materials and money; the outputs are products, and the goal (or one of them) is profit. In a university the inputs are students, and staff and money; the outputs

are educated persons and the goals include service to the community and the development of knowledge.

A system of this kind is embedded in the environment, and is in fact dependent on the environment for its inputs and the disposal of its outputs. Changes in the environment must be met by adaptations of the system, and the managers in the system from the Vice-Chancellor downward are responsible for making the adaptations necessary.

Four main areas are available for change - strategy (or how objectives are to be achieved), structure (or how the people will be organised to implement the strategy), people (their skills and motivations) and technology (how things are done). These four areas interact as shown in Diagram 2. Changes to strategy require changes to structure and these in turn may require changes in people and changes in technology. Introducing a computer - a new technology - means introducing people with different skills who must be fitted into the structure at the appropriate place.

An information system is a new technology. The nature of individual jobs will change - some will be expanded, some disposed of. Structure must be changed as a consequence. If it does not, then it's likely that the information system will be of no value. The involvement of the Systems Manager in initiating, developing, and implementing, new structures is vital. How he allocates his resources will determine how information systems are developed and in turn, therefore, how the organisation is developed.

I have spoken so far of a number of different roles for the Systems Manager - of the need for him to report directly to the Chief Executive, of the need for his managerial competence both in relation to his own projects and in relation to his involvement with users, of the importance of his contribution in helping managers define information needs and report formats and of his involvement in aspects of organisational change.

Let me conclude by referring to one further role. I spoke earlier of cost/benefit studies but I did not expand on it there. There are I

DIAGRAM 1.

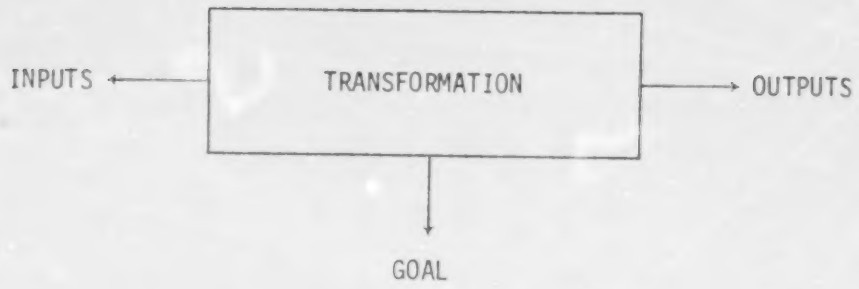
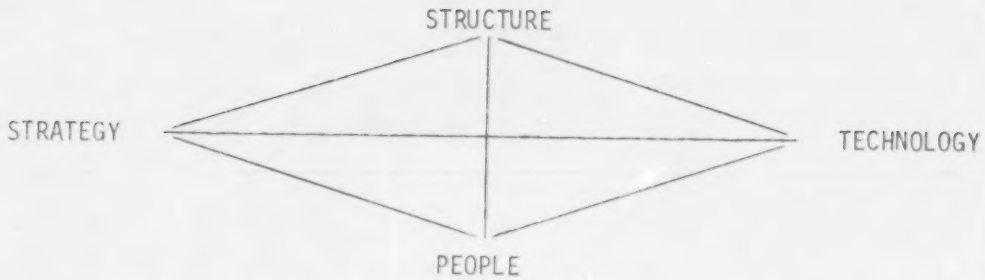


DIAGRAM 2.



believe four aspects of feasibility with which the Systems Manager should be concerned. Cost/benefit analysis - or if you prefer it cost/effectiveness analysis, or economic feasibility is only one. Technical feasibility is a second and is closely tied to economics. Nowadays there is very little that cannot be done for technical reasons. The other two areas are social responsibility - should it be done - and operational feasibility - even if it is done, will it work in practice. The latter is not a technical question. It is a question of people. Will the reports be used to generate the benefits anticipated in the cost/benefit study? Will Departmental Heads use centrally produced expenditure reports or will they continue to keep their own because they "don't believe the computer"? Will managers make better decisions, or is it beyond their competence to do so? Are organisational changes required, and if so can they be made?

This, I believe, is the most exacting role of all for the Systems Manager. On his correct assessment of the operational feasibility of the systems he introduces will depend whether his section really provides an information service to the University or is a disgraceful waste of public money.

SUMMARY OF THE MAIN ISSUES RAISED IN DISCUSSION

In response to a question Mr Masters indicated that he considered that it was likely that at present no university in Australia had a "systems manager" as described in his paper. He regarded the systems manager as the person responsible for organising the information service to the university but this need not include managing the computer or the data processing section.

Some organisations had set up a "management services group" to include an O & M section, computer services and operations research.

It was noted that this person, because of his key role in the control of the flow of information, would be in a powerful position. Because of this it was important for the systems manager to report direct to the Vice-Chancellor or the Deputy Vice-Chancellor primarily concerned with the internal operation of the university. He needed to interact with persons with equivalent responsibilities. The precise structure of the arrangements would depend on the particular organisation within an institution.

The need was recognised for an informal information system, commonly called the "grape vine" and it was considered that the chief executive needed to develop this system.

THE CURRENT ROLE OF A D.P. SYSTEMS MANAGER

D.E. Ritchens, Manager, ADP Unit, Macquarie University

In perhaps its widest definition a systems manager is charged with responsibility for defining, processing and interpreting all information of general university interest. This type of role would in many ways be analogous to that of Financial Controller.

In most Australian universities the present situation falls considerably short of that theoretical position. In this paper I will try to say something about the current role of a near equivalent post, that of Data Processing Manager, and to analyse why this falls short of what may be encompassed by a systems manager in the wider sense.

Information as a resource

Information has only relatively recently come to be recognised as a centrally usable resource and so the role of the systems manager I suggest is in the formative stage still. This may explain why the term "systems manager" doesn't occur on our establishment lists.

Registers of staff, and financial ledgers have been kept for a long time; more recently central space inventories and equipment registers have come to the fore as central management aids.

I query, however, whether very many Australian universities have yet charged a nominated systems manager with the responsibility of compiling and maintaining a comprehensive register of all potentially useful information. My own experience has been that often a data dictionary of sorts exists, but only as an aid to the management of existing computer systems. There are as yet only fragmentary pressures from outside D.P. to incorporate this into a comprehensive register of university information, perhaps most likely triggered when a senior staff member returns from a visit to WICHE.

The D.P. Manager plays a major role in providing the systems for information processing, and doing the computer processing, but often the interpretation of processed results will be done for management committees by a statistics officer or an executive head of a user area. This division may be deliberate for reasons of internal control. The total systems manager responsibility is therefore a fragmented one. In the "Survey of Management Information Systems" produced for this Conference you might cast your eye down the column headed "Section produced by" and note the variety of entries that occur - the absence of "Systems Manager" will be quite apparent.

Progress towards an M.I.S.

Most D.P. Units have started life with high hopes of keeping to a timetable for the phased creation of new systems leading to complete new "integrated" information processing methods in, say, five years. Few, if any, of these hopes have yet been realised. The reason, I suggest, is almost always an underestimation of the size of the "maintenance" operation once the first system is operational.

The causes of a high maintenance load vary from place to place: badly written programs that are difficult to modify, frequent changes in computer hardware, unscrupulous senior users pulling rank on the D.P. Manager to make life easy for themselves, systems put in in a hurry with poor documentation or without a number of desirable features, or just an irresistible urge to tinker with working systems. The cause may vary, but the effects are usually the same: frustrated senior management, a demoralised D.P. Manager, and not at all the type of environment in which one discusses management of total information systems.

Development of new systems in relation to M.I.S.

Should the management information come from the data processing systems? I'm sure we agree that to avoid duplication it should, but in practice it can be up to ten years before the data processing

system is adequate for the purpose. Often the brief to produce a new system has been an urgent one from a user primarily concerned with other, specific, reasons for change (an accounting machine won't last beyond December, the job just can't be done in the required time using the present system, etc.); to slow development down in these circumstances by raising questions of unsought reporting leaves the D.P. Manager open to criticism for unwillingness to solve the problem that is worrying the user.

In part, though, the reason may be entirely different: the development time lag before the D.P. Manager can produce useful management reports is so great that the task is given to some other person who either creates duplicate summarised files for his purpose or writes his own extract programs to take information from the D.P. files.

The net effect of these moves is again to fragment the role of what could be a single systems manager.

Education of management

The D.P. Manager is at present still very much an agent of change, and this implies that education or re-orientation of user-managers to adapt to the new situation is inevitable. But does the D.P. Manager provide this? Almost without exception he is still not the holder of any formal qualification that comes at the end of a period of professional training in information processing, and his authority to speak may therefore be questioned. He may be regarded by some as a technician. He may even be regarded with intense suspicion that came about when he or his predecessor was consulted as an oracle in the early days of computers and gave poor advice that was followed and led to serious mistakes.

His advice may therefore carry little weight. In some universities, however, he may not be heard at all - the senior administrators may prefer to consult their Computing Science academic colleagues for

advice, or go to outside consultants. Often the advice sought will be on the working of specific systems, rather than the development of one overall information system.

In any event, providing advice to senior management on the development and use of a university M.I.S. is not a major current interest of most D.P. Managers.

Other limitations on the M.I.S. role of the D.P. Manager

In most people's minds there is a link between Management Information Systems and the use of a computer, probably because the volume of information to be processed in a limited time really requires a computer. The limited size of the computer, the problems of operating it, or the difficulty of obtaining adequate access to it if it is a central facility, may be a very real practical part of the life of a D.P. Manager at present.

He may also have to choose between getting limited output from staff who lack formal training, or spending both time and effort in raising their level of competence by in-house training.

Put into other words, the manager who perhaps could play a more significant role in university systems development may at present find he has of necessity to spend a disproportionately large part of his time on housekeeping activities within his own unit.

Conclusion

Systems are continually being reviewed and computerised, computer time is becoming more available, formally trained staff are entering the D.P. profession, users are becoming more aware of what is possible, and some systems are well enough run in now, that they can be classed as reliable.

The D.P. Manager, despite the limitations discussed above, is currently moving slowly in the direction of the systems manager role

in its wider sense. But should he be pushed forward or restrained, and is the role to be his or that of someone else in the administration?

I suggest the answer should not arise directly, but out of the replies to the following three questions which I believe we must now start to consider:

- should information content and information processing be the responsibility of one person?
- does the present spread of information reporting tasks best serve our needs?
- is a University Data Dictionary a relevant tool now, and is it a necessary part of an integrated data base?

My conclusion is therefore that, althogh as universities we do not at present have systems managers as such, the time is appropriate to consider our presently fragmented information processing as parts of a whole that could be consolidated under the wing of a systems manager at some time in the future.

SUMMARY OF REMARKS MADE IN PRESENTATION

Because of the development of computers, Mr Ritchens noted that the universities that started in the 1960s had an opportunity for information system development that was not available when older universities had set up their systems. It was also in the mid-1960s that computer salesmen were pushing the concept of a complete integrated management information system. He did not consider that many people in administration were yet thinking of a centralised information resource existing in the university and many were still apprehensive about computers.

Apart from computer program specifications he doubted whether data dictionaries had been developed in user areas. The present trend in Australian universities appears to be for the data processing manager to provide systems for information processing and a statistics officer to interpret the processed results. These two people are often the only people whose area of working cuts across the various administrative divisions.

Mr Ritchens noted that much of the time of data processing staff was taken up with maintenance of existing operational systems. One of the difficulties encountered by Mr Ritchens was to get statistical information from data stored on computer files. He noted that in general data processing staff were not professionally trained in commercial data processing although some colleges of advanced education were now producing persons trained for three years in that area.

SUMMARY OF THE MAIN ISSUES RAISED IN DISCUSSION

In reply to a question on the possibility of more co-operative development of operational data processing systems by Australian universities Mr Ritchens noted that there were only a small number of institutions with different structures, levels of development and computing equipment. Some interchange of systems had taken place, the most significant probably being the payroll system developed at Monash University.

Although he considered that a fully integrated management information system might be the long range objective a more immediate goal should be to get comprehensive files within each user area, e.g. staff, student, finance and library.

Dr Lawrence indicated that the lack of high level information scientists in U.S.A. in 1966-67 was one of the motivations in creating NCHEMS. Packages developed centrally by NCHEMS had been made available at cost of reproduction and used by many institutions with various computer installations. He mentioned that $5 million and 5 years had been invested in project INFO, a totally integrated system at Stanford University. Although the technical problems had been overcome, jurisdiction disputes were not able to be resolved and the project was terminated. NCHEMS had decided to develop separate operational data files in about 10-20 areas and data management systems to allow information to be extracted from these files on an ad hoc basis. Another alternative approach was to develop a management information system separate from the operational data bases. Dr Lawrence said the commitment of the Vice-Chancellor and senior staff was needed to implement a management information system. He noted that Australian universities had the opportunity to learn from the problems experienced in U.S.A. as there was at present only a relatively low level of development in this area.

EXTERNAL DEMANDS FOR INFORMATION ON UNIVERSITIES

Professor P. Karmel, Chairman, Universities Commission

Requirements for information from bodies external to a university may be divided into three types:

- the needs of individual universities for comparative information on other institutions;
- the need to provide general public information on the operations of the university system;
- the needs of Government planning and funding bodies; in particular the Universities Commission requires information to enable it to carry out its statutory function to advise Governments on the financial requirements of universities.

PRESENT ARRANGEMENTS

1. At present the external requirements for information set out above are met in the following ways:

   - *University Statistics Collection* (USC). This is the principal source of statistical information on universities. Data from this collection are published annually by the Australian Bureau of Statistics in *University Statistics* and by the Universities Commission in *Selected University Statistics*. Additional statistics from these sources are published in the Commission's triennial reports.
   - *Universities Commission triennial questionnaire*. Most of this information is not published.
   - *Special surveys* (e.g. the annual survey of the Graduate Careers Council on First Destinations of Graduates, the TERC/Fensham study of new university entrants, the Department of Education/AUS study of student finances).

- *Ad hoc requests* from the Universities Commission, Federal and State Government departments and other bodies.

2. There are some deficiencies in these arrangements, including:

   - time lags of from six to twelve months in publication of information from the USC.

   - lack of flexibility in the existing USC system since, although all the basic data elements are collected, only a limited range of classifications is available.

   - differences in basic definitions and classifications used in the two tertiary systems.

3. The development of a computer-based system for collecting student data under the USC will help to overcome some of these deficiencies. An outline of the system which is currently being developed by the Joint Committee on Computerisation of University Statistics is attached as Appendix 1.

4. The basic information required by the Universities Commission to carry out its statutory functions relates to

   enrolments
   student load
   staffing
   libraries
   expenditure - recurrent
   - research
   - equipment
   - buildings
   space holdings

The information which the Universities Commission currently obtains in these areas is generally sufficient to enable it to advise the Government on the financial requirements of universities.

FUTURE NEEDS

1. There are obvious difficulties in predicting future external requirements for information on universities. Information needs can be influenced by changes in governments leading to new policies, different economic circumstances, new administrative arrangements (e.g. proposed Tertiary Education Commission), or new legislative requirements (e.g. information on student grants and loans).

2. While the Universities Commission believes the information it is presently receiving through the USC and its triennial questionnaires will be sufficient to enable it to carry out its statutory functions in the foreseeable future, given that the development of a computer-based system for student statistics will provide greater flexibility in that area, there are some areas where the availability of additional information on a regular basis could assist the Commission:

   - recurrent expenditure by department
   - EFTS by year of study
   - annual up-dating of triennial projections
   - data on utilisation of facilities including libraries, equipment, computers and other building facilities
   - student performance and graduation rates
   - staff turnover
   - entrance standards

   It should be stressed that the Commission is not necessarily foreshadowing that it will be collecting any of the above information in the near future. It would, however, appreciate comment on the feasibility and value of obtaining such information.

3. In addition to the information requirements arising from the statutory function of the Universities Commission, there is a number of aspects of tertiary education which are likely to require closer examination in the future. These include:

   - academic staff structures (requiring information on age distribution, distribution of staff through ranges)
   - estimates of supply of skilled manpower (requiring improved data on student performance and course completions)
   - cost effectiveness studies (requiring the development of outcome measures and improved information on subsequent careers of graduates and 'dropouts')
   - studies of socio-economic backgrounds of students
   - analyses of demand for tertiary places.

   The Universities Commission believes that many of these data requirements could be met through ad hoc collections and special surveys. It would also envisage that the studies themselves might, in many cases, be carried out by bodies other than the Universities Commission.

FUTURE ARRANGEMENTS

While the Universities Commission does not envisage any major expansion of its requirements for data for its own purposes, it considers that improvements in the arrangements for collecting, utilising and disseminating statistical information on the university system are desirable. It believes such arrangements should reflect the following principles:

- The basic collection of statistics (USC) should continue to be organised on a co-operative basis between the parties involved (the universities, the Universities Commission and the Australian Bureau of Statistics);

- the USC should be developed as a computer-based system to the extent that this is warranted by increased timeliness, cost savings and improvements in the availability of information;
- extension of the USC collection or development of additional regular collections to be made only where these are necessary, in other cases special surveys should be used;
- a system of standard definitions and classifications for use in both regular collections and ad hoc studies should be developed. (A start in this direction has been made through the data element dictionary being prepared as part of the computer-based system for student statistics in the USC);
- decisions to seek additional information, whether made by the Universities Commission or other bodies should take account of the extra cost involved in collecting the information in comparison with the benefits to be gained from its use;
- care should be taken by all bodies involved in obtaining information on university activities that, as far as possible, duplication of effort is avoided.

APPENDIX 1

JOINT COMMITTEE ON COMPUTERISATION OF UNIVERSITY STATISTICS

BASIC PRINCIPLES

The basic principles which have been developed by the Joint Committee for the development of a computer-based system of university statistics are summarised below:

1. Initial attention will be concentrated on student statistics. The needs for new systems to handle statistics relating to staff, libraries and finance are less urgent, and fewer universities would be in a position to supply data in a computer-readable form than for student statistics. In any case, such systems would seem likely to be largely self-contained. Virtually no consideration has been given in the work so far to needs other than for student statistics. The AVCC has resolved "that the pilot project relating to student statistics should proceed"; it has not agreed "to the collection of other statistics on computer tapes".

2. Control over detailed student records, as currently held by the universities, whether in computer-based or manual systems, should remain entirely with the individual universities.

3. Only an agreed set of selected items will be made available from student records in a standard computer-readable form and a common format, and supplied by the universities to a central processing agency.

4. In order to retain maximum flexibility in the use of the system, data will be supplied in unit records relating to individual students, rather than in semi-compiled form.

5. Any items, specifically including name and address, that could readily disclose the identity of an individual student will be omitted from the records made available by universities. However,

a unique number (for each reporting period and university) would be needed for each student record, although this need not necessarily be the standard student number regularly used by the university. While the identity corresponding to each number need be known only to the university, such a number will be needed to enable any queries to be resolved as a result of editing checks or other apparent data inconsistencies. (The Committee is recommending that the same number be used for a student from year to year to assist in the development of longitudinal studies if these are sought in the future.)

6. The items included in the records for each student should cover at least most of those currently needed to compile standard UC forms and produce statistics as published by the ABS, as well as those other items for which a probable need in the near future can be foreseen.

7. The development and use of a central system will depend crucially upon standard classifications and code structures, as well as upon common definitions of all data items. For this reason, the development of a data element dictionary and associated statistical classifications and codes warrants high priority.

8. Control over processing and use of centrally maintained records (and possibly over publication of derived statistics) should be vested in some type of joint co-ordinating committee, the structure and mechanism for which have not yet been formulated. This would ensure that one participant in the system is not able to extract additional information, unknown to the other participants, particularly the universities who supplied the information, and possibly without adequate understanding of particular local circumstances relevant to its interpretation.

9. It is currently envisaged that data will be collected and made available to the central processing agency each year for student enrolments as at 30 April (as at present). However, extension

to more frequent reporting, especially as more universities move to a semester system, may be necessary.

10. The central processing agency would desirably, and most probably, be the ABS.

The benefits expected from a move to computer processing include:

1. reduced clerical effort, on the part of individual universities, the ABS and the UC;
2. consequently, more timely statistics;
3. availability of a greater range of data and hence wider information.
4. increased adaptability in meeting both regular and ad hoc statistical needs (and the avoidance of some supplementary collections otherwise needed);
5. availability of comparable time series; and
6. possible uses by individual universities to produce tables not otherwise currently available; and greater information for management and administrative purposes for the universities, UC and AVCC.

SUMMARY OF REMARKS MADE IN PRESENTATION

Professor Karmel elaborated on the requirements for information from bodies external to a university.

External demands for information

The first external demand was from other universities seeking information for comparative purposes. Universities in common with other major sectors of society are expected to provide information about themselves for the general information of the public. This is the reason for the collection of statistical information by the Australian Bureau of Statistics, not only about the public sector, but from private businesses, not only about individual people and individual households, as in the case in censuses, but also about individual businesses. This information is produced in response to a general belief that members of the community are entitled to know something about the operation of all the major segments of the community. Information about universities is therefore required by the public generally, by politicians and by general research workers. There is also a demand for public information to answer specific questions. From time to time questions are asked in Parliament and it should be possible to answer some of these by looking up published information.

Information is also required for the purposes of Government planning and the funding of the institutions. In this respect the main body which is involved, from the university's point of view, is the Universities Commission. The Commission seeks information for three reasons:

(i) to understand the nature of the university's activities and the significance of these activities.

(ii) to enable the Commission to meet a statutory obligation to advise the Minister on the financial needs of the universities.

(iii) to justify the recommendations made to the Government by the Commission and for this reason the Commission has included in its reports information beyond that strictly necessary for assessing grants.

Sources of information

The main source of information is the university statistics collection. This was initiated over 20 years ago but has been improved greatly in recent years mainly as a result of a co-operative arrangement between the Commission, the ABS and the universities.

A second important source of information for the Commission in making assessments for funding purposes is the triennial questionnaire, which provides some additional information beyond that in the Statistics Collection and much more information about building requirements.

The Commission has also made special collections such as the space inventory, the survey of union finances and the survey of financial problems of residential halls and affiliated colleges. Certain cost data has been obtained from some universities for the manufacture and updating of index numbers. There was a special collection of recurrent expenditure by department for the year 1973. The Commission would avoid making these special collections continuing unless it could be shown that there was a real benefit in doing so.

The universities also exchange information amongst themselves such as the A.V.C.C. summaries. There are also other regular collections such as the first employment destinations of graduates co-ordinated by the Graduate Careers Council. The Department of Education also publishes summaries relating to such matters as the availability of postgraduate awards and has been involved in some special surveys such as the survey on student finances and the survey on the reasons why students did not accept offers of university places. There are also studies of a research kind such as studies

of entrance to universities. Ad hoc requests are also made on universities by the Commission and other government bodies.

The supply of information does involve the collection of a great mass of material and it is important to ask whether the cost of collecting it is worth the return gained. In making an assessment of the grants to recommend the Commission needs information on enrolments, student load by department, academic and non-academic staff, libraries, expenditure (recurrent, research, on equipment and on buildings) and space holdings. The Commission also needs information, most of which does not come from universities, to update the index numbers which are used for cost escalation.

Possible future needs

It would be useful for the Commission to have information on recurrent expenditure though it would probably suffice to have this information about every three years. It might be useful to have student load by year of study as some universities have claimed that more account should be taken of the load of honours students. There might be some advantage for the Commission, and indeed for the universities, for the triennial projections to be updated annually.

The Commission would probably wish to continue to collect information of the utilisation of space. Information on library utilisation including the use of seats in the library and library borrowings could be important in the future as libraries would continue to grow even though enrolments did not. In a situation of no growth additional information about the age distribution of academic and other staff may be necessary to make a case for growth in grants.

Professor Karmel considered that it was important for universities to do some student cohort analysis themselves even if it were not on the scale of the 1961 Study. Questions have been raised on the high rate of failure and analyses have been done on the cost of failure based on this study, which is now out of date.

Further information is needed on the interface of the universities or colleges and the labour market. Although the prediction of manpower requirements is a difficult exercise there are some areas such as medicine and dentistry where university graduates have few alternative occupations. The Commission is at present engaged with the Commission on Advanced Education, the Schools Commission and the Department of Education on a survey of the supply and demand of teachers up to 1985. Some account of manpower requirements may need to be taken when determining the number of university places. More information is needed about the demand for tertiary places and there are problems associated with the planning of the appropriate faculty mix. In older universities the distribution of students between the different faculties tends to reflect a historical situation with minor modifications. The new universities tend to have their own judgment on the experience of the older ones but it may be in an era in which student preferences are changing that new universities ought not to concentrate on some of the areas in which they have customarily done.

Another important area for future research is the effect of slow growth or no growth on educational institutions. Growth rates in universities have steadily declined from over 10% in the early 1960s to less than 3% for 1976. Some older universities now have staff clustered around the tops of the senior lecturer and lecturer grades. Problems will arise in connection with the career prospects of staff, the general flexibility of the institution, the prospects for young people and indeed the health of the institution which would probably require a reasonable intake of bright young people. At other universities there is a large number of staff steadily mounting the salary scales. There may be problems for new institutions which may not experience rapid growth. Information will be needed to support measures which may cost money to prevent the university system clogging up and losing flexibility, innovation and creativity.

Professor Karmel indicated that he considered that the best arrangement for the collection of statistics was a co-operative

arrangement involving the universities, the Commission and the Bureau of Statistics, where appropriate. There already has been considerable progress in this and further progress is expected with the development of a computer-based system. The onus should be on those who want to use statistics, including the universities themselves, to prove that there is a benefit which will outweigh the costs involved. Standardisation of definitions or at least the production of definitions which are compatible and can be translated one into another are needed both among the universities and for the Commission.

THE EXTERNAL DEMANDS FOR INFORMATION AND THE EFFECT ON UNIVERSITIES

Summary of paper presented by Professor B.R. Williams, Vice-Chancellor, University of Sydney

Professor Williams indicated that the main external demands for information from universities came from the Universities Commission. The annual statistical return had been improved greatly after the last major review about three years ago. The triennial submission is a major undertaking for each university. It appeared that in the last submission almost all forms did contain relevant managerial information for the universities as well as for the Commission. Unfortunately in the past a mass of information had at times been requested, such as the teaching commitments by department, which appeared to be of little use to either body.

The triennial submission has had a very important impact on universities altogether. It has made planning a much more definite process and universities have probably become more efficient as a result.

Professor Williams spoke of problems on buildings. He considered that these arose because:

(i) most buildings are necessarily one-off,

(ii) some universities are not very good at cost control in the planning stage in controlling architects whose fees increase with the cost of the building, and

(iii) in a period of inflation you can often lose more from delay than you can gain by sending plans back to architects.

The space inventory had imposed a heavy burden on universities. The results were difficult to interpret because different methods of teaching require a variation in space per student or space per staff and because some very old buildings had a spaciousness not reproduced now but this space was very expensive to subdivide.

Although reluctant to suggest the collection of any additional information Professor Williams questioned whether the Commission and the universities were measuring the right things. For instance, perhaps too much weight is put on student:staff ratios. Almost all of the published statistics relate to input and little information is available about input/output relationships. He considered that studies along the lines of the "1961 Study" should be undertaken more often.

Professor Williams noted that the Commission had initiated a number of special enquiries and at times,such as for the one related to further education, a lot of information was sought in a short time.

A considerable part of university research does depend on external grants. The information sought by the ARGC and the NHMRC when staff apply for grants seemed reasonable but the demand for accounting information does impose a great deal of burden on the finance sections of universities in control and reporting. Often these grants only partly financed a particular research project and accounting records needed to be able to apportion expenses and to keep track of the predetermined categories for grants.

With one exception all universities are incorporated under State Acts of Parliament. The main demand now was for accounting information. A total income and expenditure statement had to be prepared which became fairly meaningless because it amalgamated a whole range of accounts and wiped out the distinction between capital and income.

Answering Parliamentary questions can often be quite time consuming. There are often "episodic" demands for information, one of the most dramatic being during the time of the National Service Act. The proposal that the responsible Minister should have access to all university records (in the belief that universities were harbouring draft dodgers) was not received very well by universities.

Indeed the reaction was so unfavourable that the Minister did not proceed. However, this unfortunate incident caused many universities to take an attitude to confidentiality which may be hard to justify.

Demands for information from the Press often came as a result of distorted information supplied by special interest groups. Accusations relating to senior academic appointments are difficult to answer adequately, consistent with maintaining proper confidentialities. Most universities have had experience of this kind in relation to student protest of one kind or another.

There is also a demand for general information from schools, industry and the public at large. Universities spend a good deal of time in preparing information booklets for schools on courses, entry conditions and vocational guidance. However, there is some lack of demand for this information. Demands from industry relate to potential output of graduates or of research and to content of particular courses. In respect of public information Professor Williams indicated that he considered that little was known about benefit-cost ratios of different levels of expenditure in universities. For example, has the improvement in staff:student ratios paid off and have the universities the proper ratio between teaching and research? Little is also known about the benefit-cost ratios of the different types of education. Colleges of Advanced Education were introduced to provide a different kind of education and were expected to be much cheaper. Universities also do not know a great deal about what various types of education fit people for. Professor Williams considered that Engineering and Medicine could be just as good a general training as Arts or Law. The relative cost of training different types of graduates was important but attempts to predict demand had been mostly unsuccessful.

DISCUSSION ON EXTERNAL DEMANDS FOR INFORMATION

Mr Marginson suggested that there could be merit in a working party consisting of representatives from universities and from Commonwealth granting bodies to discuss the accounting information requirements.

In response to questions about the implication of the Environmental Protection Act for university buildings, Professor Karmel indicated that the Commission had discussed the building proposals in the Sixth Report with the Department of the Environment and there appeared to be no objections. However, it would still be possible that a university might have to prepare an environmental impact statement should any section of the public object to a building or to the acquisition of land. Building costs in the report were at December 1974 prices and indexation would take account of increases in building prices up to when the building commenced. The Commission would try to take into account any changes in a building that might be required as a result of an environmental impact study.

Commenting on the problems of budgetting in a steady state, Professor Karmel indicated that this was an area in which the Commission hoped to carry out further studies. One of the problems for universities which is not apparent in Government Departments or CSIRO is that funds can be linked with students.

Professor Williams considered that it is now more important for universities to undertake more research into their own affairs. For example, universities should be in a position to ascertain quickly the financial implications of a proposed change in student numbers. They should be able to analyse movements in cost and to look critically at the processes in the university (e.g. the impact on the input:output ratio of employing less staff). One way of doing this would be for a university to set up a central information department. Staff involved would need to know a lot about the university and be able to recognise when requests should be answered

by other persons. The Vice-Chancellor would need to work closely with the person in charge and there was often a need to change quickly the level at which matters were handled.

Professor Williams noted that the Australian Vice-Chancellors Committee had initiated some joint projects. There could be advantages for a number of groups to be engaged in a major project such as the benefit:cost ratios of different policies with a committee to co-ordinate the work being carried out in a number of universities. This approach was probably better than setting up a separate research section attached to the AVCC although initiative could of course come from that Committee.

Dr Lawrence indicated that NCHEMS has chosen a co-operative method of working with institutions because of the large scale cost. NCHEMS did consider an approach of distributing the development work over a number of institutions. However, when funds became available NCHEMS was able to set up a central development team. Common data definitions, standards for procedures and analytical tools had been developed. NCHEMS was also developing a research agenda in the area of cost-benefit study with the aim of encouraging researchers within the universities to undertake projects with NCHEMS serving as a co-ordinator. Professor Williams pointed out that the scale of operation in USA was far larger than in Australia because of the relative student numbers. Dr Lawrence indicated that there were ten million students in the institutions associated with NCHEMS.

Some discussion took place as to whether it would be possible to measure the value added by the university even to students who did not complete their programs. Dr Lawrence indicated that drop-out was not a big issue in USA at present; the assumption seemed to be that there was benefit to be gained by any college experience. He indicated that NCHEMS was working on developing output measures, both cognitive and affective but this was seen as a long-range project.

Professor Karmel indicated that he did not think the publication of the formula used as a basis for recommending recurrent funding would be in the interest of universities as they would come under pressure to allocate resources within the university in accordance with the same formula. If the department costs per student were published they would show a large divergence of costs of the same department in different universities and would lead to pressure to drop to the lowest cost level.

Dr Lawrence indicated that the publication of cost data for institutions in USA had resulted in such pressures both from within the institutions and from the public.

Information and Analysis in Higher Education Planning and Decision Making in the United States - 1975

by

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Part I

Introduction

Information and analysis and the systems and people that make them available to planners and decision makers do not constitute a monolithic technology. Many approaches are available to choose from and indeed, many are used. In spite of this diversity, however, some approaches to providing information and analysis to decision makers in higher education have become more widely accepted than others. To understand current trends in information-systems and analytical procedures, one must have some understanding of the current state of higher education in the United States and the forces that have brought about increased emphasis on scientific planning and management.

From 1955 to the late 1960's, American higher education expanded rapidly. Enrollments in traditional colleges and universities increased from 2.8 million in 1955 to 7.6 million in 1971 (see Table 1). This growth was not simply related to population growth. Year after year during this period, an increasing proportion of young Americans decided to go to college. The conviction developed and grew in the American public mind, at least until the late 1960's, that higher education was essential to individual success and wealth, to the economic prosperity of the nation, and to American power and influence in world affairs. This conviction was reflected in the freeing of public purse strings to support higher education.

Many benefits were perceived to derive from this high level of support. Those with higher education earned higher salaries and achieved more social status. Nationally, the economy was booming and unemployment was low. Even those wo did not seek or could not obtain a higher education

Table 1

U. S. Higher Education Enrollment and Educational and General Expenditures for Selected Years

Year	Educational and General Expenditures	Total Enrollment	Public Enrollment	Private Enrollment	% Public	% Private
1955/56	2,788.8 Million	2,678,623	1,498,510	1,180,113	56	44
1965/66	10,004.0 Million	5,570,271	3,654,578	1,915,693	66	34
1968/69	15,211.3 Million	6,983,093	4,928,320	2,054,773	71	29
1969/70	17,400.0 Million	7,299,000	5,260,000	2,040,000	72	28
1970/71	18,200.0 Million	7,608,000	5,420,000	2,0[illegible],000	73	27
	Percent Increase		Percent Increase			
	1955/56 to 1969/70 = 523.91%		1955/56 to 1969/70 = 172.5%			

benefited from the burgeoning technology and the general affluence. It seemed clear that higher education was a primary contributor to these desired circumstances.

During this period, the funders of higher education, public and private, made only minimum demands on institutions for accountability. Greater priority was given to responding rapidly to the ever increasing demands for instruction, research, and public service than to efficient use of resources. Professors and administrators, once relatively poorly paid, were now substantially paid and accorded a new high status in their communities. Funds were provided to institutions with relatively few restrictions as to their use. The price the American public was willing to pay for higher education was substantial and few long-range questions were asked. By 1970, better than 40 percent of Americans 18 to 24 years old were engaged in some form of higher education. Better than 50 percent of all high school graduates were enrolling in college the year after high school graduation and half of these were completing baccalaureate or higher degrees. During the mid-sixties, planners and decision makers in higher education, despite indisputable birth-rate figures showing that this kind of growth could not continue forever, blissfully planned for even greater enrollments. The continued availability of whatever funds would be needed was taken for granted.

Then, in the late sixties, these expectations began to crumble. Fighting a war in Indochina while maintaining a full domestic program of services had its impact on the American economy. Resources began to get scarce. Inflation increased alarmingly. At the same time, the general

public attitude toward higher education began to change. Student riots, stimulated by the war in Indochina, caused many taxpayers to question what higher education was teaching the younger generation. Many students experimented with drugs, rejected the sexual and marital mores of their parents, challenged the established social and political structures, and derided the traditional American work ethic. The campus came to be seen by a large segment of the public as not only the scene but the cause of moral, social, and political radicalism. In general, the credibility of higher education was tarnished. And inevitably, in line with the decline of the birth rate that had begun in the fifties, the rate of increase in enrollments began leveling off in the early seventies.

The cost of higher education per student rose with inflation and, in some cases, taste. The total cost of higher education increased dramatically with rapid enrollment increases. Then came the economic recession. Ph.D.'s were underemployed if not unemployed. Teachers were in surplus. All of these events raised serious questions about the management of higher education, its philosophical thrusts, and the benefits society gained from its investment in higher education.

Accountability has become the watchword. Institutional administrators are sharply aware of their need for information to justify requests for funds, defend actions and missions, and to prove that higher education can manage its affairs appropriately.

The task is difficult. Our early efforts to be responsive to the demands for accountability showed that we were in substantial disarray and disagreement. We gave different answers to the same questions, depending on our various perspectives and information available. Of

course, the central strength of American higher education--its diversity--causes institutions to respond in different ways to a given question. But this is hard to explain to legislators and congressmen seeking to establish uniform State and national policies toward higher education. Our supporters complain that we do not, cannot, or will not provide them with accurate, reliable information with which to make the case for higher education. Our critics charge us variously with incompetence, naivete, boondoggling, and deception.

The questioning by funders is comprehensive, dealing with virtually every aspect of higher education. But in the final analysis, the questioning is most severe when we get to budget. Thus the development of new concepts and uses of information and analysis focused initially on resources and the uses to which they are put. It has since broadened to embrace other concerns, as time, resources, and environmental crises have dictated.

Philosophical Approaches

During the late sixties, when the new emphasis on accountability began, each institution and system of institutions responded individually, as best it could. Little thought was given to cooperative approaches. In fact, it was feared, and still is feared in some quarters, that cooperation in such an endeavor might result in some institutions gaining while others lost--and no one knew who would win and who would lose. Others felt that such developments might result in a standardization that eventually would destroy our highly desirable system of diversified education. In the early stages, individual institutions turned to

industrial consulting firms for assistance. But applying industrial management concepts to higher education had limited success, primarily because higher education lacked the neat, simple indicator of good management available to the industrial and commerical sector--the profit statement.

Secretary of Defense McNamara had considerable initial success in applying the concept of management by objectives--popularly known as program planning and budgeting systems (PPBS)--to the U.S. Defense Department. This spread rather rapidly to other branches of the federal government and to many State government planning and budgeting practices. Higher education also had a brief flirtation with the PPBS approaches. But many difficulties have been discovered in applying these concepts with any conformity to the basic concepts. Higher education had the greatest difficulty, principally because there is little agreement on objectives in a system which is expected to respond to the needs and desires of students representing a highly diverse set of cultures, attitudes, and requirements.

In 1969, under the auspices of the Western Interstate Commission for Higher Education, the first broad-scale cooperative effort to address this problem was initiated. The effort was looked upon as an ad hoc research and development task designed to assist institutions in solving their respective problems with regard to accountability--particularly the resource allocation problem. This cooperative effort among western institutions and States grew into the National Center for Higher

Education Management Systems (NCHEMS), whose activities now involve all States and, directly or indirectly, virtually all institutions of higher education in the United States.

While one might expect such a cooperative effort to have given considerable systematic thought about the philosophical underpinnings of bringing information and analysis to bear on decision making in higher education, such was not the case. Only now, when information capabilities have increased significantly, are we addressing the philosophical and jurisdictional issues, and perhaps it was best that way. If we had addressed those difficult problems from the first, we would probably still be debating them and would have made little progress toward improving information capability. Still, these information capabilities were developed in an atmosphere of debate and philosophical trends emerged, even though they have not been too clearly articulated.

The difficulty with adopting any particular philosophical approach is that each possible approach has its advantages and disadvantages and their respective utilities are determined largely by the decision problem and its context. As yet, NCHEMS has not adopted, and neither has U.S. higher education, any single philosophical approach--unless of course, an eclectic approach is viewed as a philosophy.

In describing philosophical approaches, it is convenient to categorize them into five groups:

1. Incrementalism, or following intuition. This philosophy argues that one cannot plan the future because political, social, and environmental forces are subject to unpredictable manipulation. Thus we should take an incremental, intuitive approach to planning and decision making--take one step at a time and see how it goes.
2. Projecting Trends. This philosophy argues that we should examine trends to see where we are headed and then plan the most efficient and effective method of getting there.
3. Alternative Strategies. This philosophy argues that we should consider the most popular policy alternatives being proposed and attempt to determine where they will lead us and the cost effectiveness of each--making this information available to decision makers for their consideration.
4. A new and as yet unnamed philosophical approach now under consideration at NCHEMS argues that public policy decision makers, at least insofar as higher education is concerned, are legion. Each has his own set of priorities, concerns, and objectives. To the extent possible, information and analysis should be designed to enlighten each of these decision makers as he becomes involved in the debate that preceeds policy determination. Thus information and analysis procedures should provide insight into effects of a particular decision with respect to each of the concerns and interests represented in the policy debate. In this way, each can argue for his point of view with reasonable knowledge and a generally reasonable policy can be synthesized.

5. The planned-future philosophy, characterized primarily by Program Planning and Budgeting Systems. This philosophy argues that we should determine what kind of future we want and design an efficient plan to get there. It measures the success of the plan by the extent to which previously stated objectives were accomplished. U.S. higher education has had serious reservations about this approach because many objectives are not measurable as yet and the diversity of needs dictates a confusing multiplicity of objectives.

The five philosophical approaches outlined above may be seen as forming a spectrum. One extreme is most attractive to those who view planning as almost completely a science. The other is favored by those who believe planning to be in essence an art. This dichotomy of outlook does exist and I regard it as a serious misapprehension, on both sides, of the true nature of planning. Any consideration of the role of information and analysis in planning for higher education should proceed from a sound conception of the planner's essential role and the intellectual talents required to play it. I believe planning is largely a function of the imagination, aided by both science and art. To my mind, there is neither a division nor an opposition between art and science. They are complementary, mutually reinforcing, and, indeed, inseparable elements in good planning.

It is very hard for me to conceive of a planner who is exclusively, or even predominantly, either a scientist or an artist. If he is not both, in fairly equal proportions, he is likely to be a very poor planner. The problem is to determine what scientific skills and tools a successful

planner should have available to him to supplement that capacity which is most crucial and indispensable--the planner's imagination. All the major advances of science, like all the great accomplishments in art, have been fundamentally the products of imagination.

Very occasionally in our history, it has fallen to a greatly gifted individual, a Leonardo da Vinci or an Albert Schweitze, to excel as both scientist and artist. Some of the leading scientists of our time have been drawn to the arts. Robert Oppenheimer was a keen Sanscritist. Fellow physicist Leo Szilard wrote fiction. Einstein himself harbored an amateur enthusiasm for the violin--though one professional who performed with him in a string quartet remarked later that Einstein did not keep time very well: in a musical sense, at least, Einstein couldn't count.

The anecdote may be apocryphal. But it is true that the musician who does not know much about the mathematics of tone, pitch, resonance, and harmony is not likely to be creative, either as a performer or as a composer. Without a mastery of technique, without technical skills, the would-be-artist must remain an amateur: it is not enough to imagine a great painting. And creating the illusion of three-dimensional substance on a flat surface is not simply a matter of lively imagination or inspiration and good materials. It requires exact knowledge of the techniques of shading, proportion, and calculated distortion to achieve emphasis. In fact, the science of optics owes much to the discovery of these effects by artists long ago.

The creative scientist expresses himself in mathematical symbols and equations which are notably lacking in aesthetic appeal. Nonetheless,

those notations register great strides of imagination--quantum leaps, such as Newton took, and Einstein. In a purely visual sense, the equation $E = Mc^2$ is nondescript. But to those who understand the symbols, the concept they express and its implications are mind-shaking. $E = Mc^2$ is a stupendous achievement of the imagination.

Jacob Bronowski once observed that a chief distinction between the artist and the scientist is the way in which each determines whether the products of his imagination are valid or not. The artist tests his imagination against the reality of human experience: his audience judges whether or not his work is true to life. The work that endures across centuries has been recognized by each succeeding generation and age as accurately reflecting the contempory perception of reality. Art mirrors life and is true to universal human nature. As Bronowski pointed out: "When Ella Wheller Wilcox died in 1919, more people were reading her verses than Shakespeare's; yet in a few years her work was dead. It had been buried by its poverty of emotion and its trivialness of thought." In short, we want art to be not only true to life, but to contain a significant truth.

Science, of course, concerns itself with physical nature--with natural phenomena that can be measured and analyzed mathematically. It is against this kind of reality that the scientist must test his imaginative insights. A scientific theory achieves the status of a physical law only when objective, quantified results of all relevant experiments confirm it to be consistently accurate.

The planner, too, is in the business of making predictions--about what people will do, what services they will need and want, and how these services can be most effectively delivered to them. But at best, generalizations about human behavior are estimates of probability, not statements of certainty. There is a certain amount of truth to the observation that statistics are like bikini bathing suits. What they reveal is suggestive. What they conceal is vital. Nonetheless, in higher education, a considerable amount of human behavior is recorded as data, and that data is objective. Numbers can be misinterpreted. They can be misused. But numbers do not, in and of themselves, falsify the experience they record.

The planner has much need of imagination and ingenuity, because his task is inherently more difficult than that of either the scientist or the artist. For the scientist, physical laws are by definition invariable: what is proved to be true today has always been true and will continue to be true. But the material realities that the planner must deal with are not invariable and static. The past may or may not be a reliable indicator of the future. The White Queen complained to Alice that "it's a poor sort of memory that only works backward"--and the fact is that empirical information does not support precise prediction.

The artist assumes that by and large, what the human eye perceives as beautiful will not change much across the centuries. And history bears him out. But the planner in higher education must satisfy human demands that are highly changeable, that are themselves shaped by many variables. The task is not hopeless, of course. An imaginative plan

should be sufficiently flexible to accommodate a good deal of unforeseeable circumstance. Even so, the planner still must answer to two different kinds of reality. In this respect, he is like the architect. It makes no difference whether the architect believes that form should follow function or that function should follow form. Both schools have produced great buildings--works of art that perform their functions admirably. Every fine building satisfies the laws of physical nature as well as the human demand for aesthetic excellence. The architect who is not both artist and scientist, whose graceful building cannot withstand high winds or whose strong and functional structure is an eyesore, soon is out of business.

Similarly, planning for higher education is concerned not only with dollar constraints and facilities, but with subjective human realities. The planner should be something of a psychologist and sociologist as well as an economist. His plan must create an emotionally satisfying learning environment, provide for equitable access, and address collective social needs as well as individual desires. In addition, of course, the plan must accommodate itself to budget realities and be accountable to funders.

The planner who undertakes all this needs plenty of assistance and cooperation. Planning is a joint undertaking by people and for people. In that respect, too, it is different from both pure art and pure science. It is true that most scientists work in teams today. But the scientific team engages in a different kind of joint undertaking than the planner attempts. Everyone on the scientific team knows beforehand what the team is trying to accomplish and what each individual's role will be in

the effort. A scientific team is essentially single-minded, and it can carry out a variety of experiments without doing harm. But the planner must satisfy many people, and he cannot afford major mistakes. He cannot experiment on people: a campus is not a laboratory. The planner also is different from both the scientist and the artist in that he cannot cloister himself. Since he must have the cooperation of many people, he is in full view as he works. His work is therefore subject to criticism as it progresses. Because his plan will affect the futures of those who are helping him to make it, he must satisfy these critics throughout the planning process--or lose their cooperation.

Part II

Information and Analysis in the Decision-Making Context*

*This section is adapted from a speech delivered at the Higher Education Colloquium, March 23, 1975, at Chicago.

One of the most serious misconceptions about management systems in higher education is the persisting impression that their purpose is to solve problems outright and make decisions. This assumption is absolutely incorrect, even though many analysts and administrators behave as if it were true. In fact, the purpose of management systems and the analytical functions they perform is to resolve certain aspects of the problem to be solved or decision to be made. Those who design management systems should be explicitly aware that some crucial aspects of problem solving and decision making cannot be resolved analytically. Designs for management systems must allow political considerations, information gained from experience, and plain old gut-level feelings to enter into the decision-making process.

But having recognized that there are limits to the proper function of management systems, we should not underestimate the value of their contribution to sound decision making. The need to improve decision making in higher education is not being questioned very much today. The increasingly short tenure of presidents and other institutional policy makers tells us either that a good many poor decisions are being made, or that the business of making decisions has become so tough that a good many educational executives have come to prefer another line of work. In either instance, information produced by good management systems and used appropriately will significantly strengthen the decision-making process.

To observe that the successful decision maker in higher education must be able to make right decisions is truistic. If less obvious, it

is no less true that the successful decision maker must arrive at decisions in the right way. Otherwise, an inherently sound decision may very well lead to bad results and so be taken to be a bad decision. The intrinsic rightness of a decision is not something we can judge in advance with much confidence. We can, however, give decisions their best chance of succeeding by making sure that they are being arrived at in the right way. That means making sure that the proper people are included in the process, that the relevant information is gathered and properly analyzed, that the decision reached is effectively communicated among constituents so that they are persuaded that it is justified, that the psychology of those affected by the decision is understood so that their interactive behavior can be accurately predicted and negative responses minimized, and that the necessary reinforcing decisions and actions will be taken by those whose collaboration is needed.

Of course, even the well designed and regulated decision-making process will sometimes produce an inherently bad decision, and being able to defend the process will provide cold comfort. But there is no comfort at all to be had in watching a potentially good decision flounder because implementation problems were not anticipated in the decision-making process. Few of us are willing to persist in unalloyed reliance on intuition and experience, saying to ourselves philosophically that catastrophes are bound to happen occasionally. There is in higher education a growing determination to improve the decision-making process and reduce the number of wrong decisions--if only to protect the professional reputations of the decision makers.

The National Center for Higher Education Management Systems has concentrated for several years on improving the decision-making process by bringing quantifiable information to bear on it. In order to surface the issues involved in the use of data and analytic techniques in planning and decision making in higher education, we at the Center have asked ourselves three sets of questions:

1. What is the essential nature of the planning and decision-making process in higher education? What motivations lie behind different perspectives? Are different approaches to planning and decision making more appropriate than other alternatives, given the environment, the people involved, and the problem to be resolved?
2. What are the pros and cons of using quantitative information in higher education planning?
3. What is the role of data analysis and synthesis in planning and decision making? What different analytical perspectives are possible and what are their ramifications?

To provide insight into the nature of planning and management in higher education, Frank Schmidtlein has described two extreme paradigms of the decision-making process.[1] At one extreme, we have the "incremental/remedial" approach, characteristically taken by the intuitive, political decision maker. The incremental/remedial process recognizes the difficulty in

[1]Frank Schmidtlein, The Selection of Decision Process Paradigms in Higher Education: Can We Make the Right Decision or Must We Make the Decision Right? Paper P-42, Ford Foundation Program for Research in University Administration (Berkeley, Calif.: Office of the Vice President--Planning, University of California, 1971).

specifying concrete goals and objectives, of explicitly separating means from ends, and of formally resolving conflicts about values. Its underlying premise is that political and social forces, if allowed to take their course, will produce the best possible solution at any given point in time. In other words, the incremental/remedial decision-making approach seeks to gain consensus regarding what relatively small, incremental step should be taken next. With each such step, one hopes to gain insights into how future improvements can be made through relatively minor adjustments--the so-called remedial process. Thus the incremental/remedial decision-making approach should achieve a sequence of politically viable improvements over time.

At the other extreme, Schmidtlein describes the "comprehensive/prescriptive" paradigm (which might also be called the "planning" paradigm). This decision-making process is characterized by its use of the more recent developments in planning and management concepts based on management science and systems analysis, such as Program Planning and Budgeting Systems (PPBS), Management Information Systems (MIS), and Management By Objective (MBO). This approach assumes that a comprehensive list of objectives can be determined in advance, that cause-and-effect relationships can be explicitly defined, and that value systems can be systematically and rationally incorporated into the overall decision-making process. The comprehensive/prescriptive method is to attack the problem with a single grand design that spells out where we are going and who does what--in advance of taking a large step with long-range consequences. Hence it is both comprehensive and prescriptive.

It is difficult to visualize either of these paradigms being implemented in its pure form. Virtually all planning and management developments and practices fall somewhere on a continuum between these two extremes. The trick is to discover what ingredients of each approach should be blended together into an overall planning and management process that is appropriate for the problem, the environment, the time frame, and cost constraints. In making this decision, it is helpful to consider some of the motivations that lie behind each of these extreme paradigms. The rationale for the comprehensive/prescriptive approach might be expressed this way:

- The growth in size and complexity of higher education gives rise to a powerful motivation to grapple with the entire bundle of important factors and interrelationships at once. It is virtually impossible to make decisions successfully in a piecemeal, incremental manner, because something of critical importance is sure to be overlooked.
- Science and technology have quite successfully explained large-scale, complex phenomena, as our conquest of space testifies. The development and elaboration of these techniques to support planning offers a good deal of promise and appears to be applicable to higher education.
- Rapidly changing conditions in higher education, and in society in general, necessitate long-range, large-scale solutions to planning and management problems. There is the danger that the dynamics of higher education will outstrip

short-run, incremental solutions, rendering them irrelevant almost before they are put into practice.

- The pressures of accountability, the infusion of a new breed of technocrats such as management scientists and computer scientists into key positions in higher education, and a constantly changing array of issues have combined to point up the shortcomings of the seat-of-the-pants approach to planning and management.
- The advocates of the comprehensive/prescriptive approach to decision making have little confidence in the basic premise of the incremental/remedial approach--which is, as we have noted, that political and social forces acting without inhibition will produce the best solution possible at any given time. A narrowly focused intuitive decision today may foreclose desirable options in the future. Instead, to the extent feasible we should examine where social, economic, and environmental forces may lead us under different policy decisions, determine what options we wish to keep open, and only foreclose options knowingly.

The partisans of the incremental/remedial paradigm see things quite differently, of course. Their rational follows these lines:

- The classic dilemma of management systems designers is that the system design is always at the same time both too large and too small. As Harlan Cleveland has pointed out, systems definitions are never extensive enough.[2] Highway systems

[2]"Systems, Purposes, and the Watergate," Operations Research, 21 (September/October 1974).

have been designed that do not account for environmental factors. Flood control systems have been designed without considering the recreation potentials of the reservoirs constructed. Models to predict student enrollments have been developed without reference to the curricular interrelationships between courses or the constraints of faculty tenure.

On the other hand, system definitions are never finite enough. In many instances, system designs are developed to meet objectives so large, vague, abstract, and long in range that the designer might as well say: "The purpose of this system is to get to Heaven." The incremental/remedial decision maker concludes that large-scale, comprehensive designs are by definition doomed to failure.

- The time-frame constraints on most decisions are simply not consistent with a process that requires one to set goals sequentially and systematically, develop a conceptual and analytic framework, establish an information system, and so on. Decision makers need the right data and the right analysis at the right time, but the right time is sometimes not known more than an hour in advance.
- Like the time constraint, the decision-making and policy formulation environment in higher education is politically determined and forces the decision maker into negotiation, consensus making, and value tradeoffs. Analysts often claim that it doesn't need to be and shouldn't be that way. From the perspective of many decision makers, however, it is

that way. Moreover, many policy-level executives in higher education feel more comfortable with the political environment than they do with the more structured approach to planning and management reflected in Schmidtlein's comprehensive/prescriptive paradigm.

When we analyze the two extreme and therefore largely hypothetical positions, it becomes clear that many factors will influence the type of decision process we actually design for use. In deciding whether it will be more incremental/remedial or more comprehensive/prescriptive, these are some of the factors to be considered:

1. The degree of uncertainty about the desired objective. Decision problems in which the objective to be reached is clearly known tend to be made (all other things being indifferent) in a comprehensive and prescriptive manner. No one would try to place a man on the moon by an incremental/remedial decision making process: that would have us shoot the man into space first and then figure out a way to get him back. Similarly, we don't lay the foundation for a new classroom building until we have decided on virtually all the detailed specifications for the building. Finally, if the decision maker knows that a decision reached by the incremental/remedial method may foreclose options that he wants to keep open, he will favor a more comprehensive analysis that shows how the more important options can be preserved.

On the other hand, decision problems in which the objective to be reached is not clearly known tend to be settled (all other things being indifferent) in an incremental/remedial manner. A decision to start a new program in higher education should not be made far-reaching in its effects if it is not known just how large the student demand for the program is going to be or what is to be emphasized in the program to meet student preferences. In such cases, we start on a small scale and feel our way.

2. The availability of reliable quantifiable information. If reliable, relevant quantifiable information is available, the decision-making process is likely to be more comprehensive/prescriptive than incremental/remedial. But in the absence of such information, the decision maker may be forced to take only small steps and proceed on a trial-and-error basis.
3. The availability of analytical capability. If the decision maker has available a considerable amount of analytical capability, the decision-making process will tend to become more comprehensive/prescriptive. If it isn't available, the process will tend to become more incremental/remedial.
4. The social and political environment will have a large influence on whether the decision-making process becomes more comprehensive/prescriptive or incremental/remedial. If, for example, many external groups are to review the decision, the process will become more comprehensive/prescriptive, so as to make the decision more defensible. If there are no external reviewers

to be called to account for the decision, he can afford to be more incremental/remedial in his approach, knowing he can correct or reverse a bad decision without damage to his prestige and authority.

5. The time available to make the decision will greatly influence the character of the decision process. Sometimes even big decisions that warrant comprehensive analysis must be made in a hurry, and we reluctantly become more incremental/remedial in our approach. If we have more time, we tend to become more comprehensive/prescriptive.

6. Who must be involved in making the decision will also have a large impact on the choice of the decision process. If large numbers of people with widely varying interests must be considered, the process may become a very uneven mixture of comprehensive/prescriptive and incremental/remedial elements. When all opinions are weighed, the indications may be so inconclusive that an incremental step must be taken to observe reaction and make necessary adjustments. On the other hand, if a strong consensus is obtained, we may take a larger, firmer step.

7. The decision maker himself has a strong influence on the nature of the decision-making process. If he is analytically oriented, he may lean heavily toward the comprehensive/prescriptive approach. If he is a risk taker, he may lean heavily toward the incremental/remedial. If he is a risk avoider, he may insist on both comprehensive analysis and small steps. If

he expects to be in the job a long time, he will be concerned about long-term consequences and thus more inclined to be comprehensive/prescriptive. If he expects to be leaving soon, he may think only in terms of small-increment decisions.

8. The cost of the decision in relation to the cost of the decision making process will also influence the nature of the decision process. If the cost of the process is greater than the cost of the decision--taking into account the cost in dollars, resources, and personal and social consequences--then the decision-making process will be simplified to bring its cost down. It will therefore tend to become more incremental/remedial than comprehensive/prescriptive.

9. A need for other decisions may arise. A decision to raise tuition, for example, should take into account the possibility that a lower enrollment may result. The decision maker biased toward the comprehensive/prescriptive approach probably will want an analysis of the empirical data on price elasticity. He may be willing to accept a limited reduction in enrollment. But he should be aware that lower enrollment will create the need for other decisions, by himself and others, in making program and resource allocation adjustments. It is dangerous to make a decision in a vacuum.

This rather long list of factors ought to be pondered by those who find themselves involved in the development of planning and management concepts and supportive information systems. The fact is that even if all agree that we should be more comprehensive and prescriptive on our

approach to decision making, often we cannot be. Some limitations on the uses of management systems are inescapable. But we still can increase our capability to be more comprehensive and prescriptive when it is feasible and appropriate to be so. If the information needed for a decision problem is not available, might it have been made available? And in time? Can we make the information available to everyone involved in the decision, in a form that will make the decision more defensible? Can we keep management system costs at reasonable levels?

To ask such questions of ourselves implies that we are persuaded that properly analyzed data does have its place in the decision-making process. Think this is generally accepted today in American higher education, provided that the information is appropriately used, is not given more importance than it deserves, and does not set off adverse reverberations in the organization--as happens, for instance if the use of data appears to be causing a shift in control over decisions. These caveats are good indicators of the kinds of issues that arise when management system information is introduced into the planning and decision-making process. Again, we should look at the pros and cons. The case against increasing the use of data has at least five components:

1. Increased emphasis on quantitative information tends to cause a proportionate decrease in reliance on intuitional considerations that reflect subjective values. Of course, quantitative information has some value basis. But it mainly represents objective facts, which are quite resistant to the pressures generated when our subjective values make us want the facts to be other than they are.

2. Increased use of data emphasizes the role of the information science analyst in the decision-making process while lessening the influence of top administrative executives. Skilled technicians are required to collect and process information and, at many stages, to interpret it. Few executive leaders understand the intricacies of administrative data processing and information anlaysis and even fewer have mastered them. Leaders are elected or chosen for their value orientation: their major function is to decide where we should be going. Analysts are chosen primarily for their technical skills and objectivity: they tell us where given decisions will lead us.
3. Increased use of data tends to make the future very similar to the present, rather than encouraging major departures. At best, information describes the past and projects a future derived from the past. It cannot project radically different alternative futures: those must be shaped by conceptual thinking uninhibited by past experience.
4. Reliance on data may leave us unprepared for the unexpected. The factual, empirical character of data can make us overconfident that we can project the future in some detail. But information is historically based, and cannot be used to predict developments that are not prefigured in our experience. The present oil crisis is a good example. Our wealth of information about supplies, reserves, profits, and consumption levels could not be combined to predict that purely political developments in the Middle East would

lead to an oil-price crisis. Indeed, the confidence created by our detailed knowledge of oil reserves and past profit motives may have kept us from developing intuitional insights that would have alerted us to the unexpected event. Perhaps historically-based information lulled us into a dangerous complacency.

5. The availability of data creates opportunities for distributing or redistributing power. More often than not, those who have information are in a position of advantage. Prior knowledge of probable freeway-exit locations and projected traffic patterns have made fortunes for motel chains. The controlled dissemination of information creates conditions favorable to those in control, and plenty of evidence suggests that those who have information dispense it in keeping with their own purposes. This can cut two ways, of course. When institutions negotiate with a state for their budgets, they would like to know beforehand how much money the state has available to distribute. For its part, the state would like to know how much it really costs an institution to support various activities. For both sides, information means a strengthened negotiating position.

Despite all those negative considerations, the advantages in increased reliance upon information in decision making are persuasive. Here are half a dozen, briefly noted:

- Information helps us understand both the past and our current situation. Information specialists have made great strides in

helping us to sort out why things work the way they do.

- Information does much to help us understand many cause-and-effect relationships in various circumstances.
- Information can serve to guard against intuitional errors. Occasionally, information can show that an intuitionally-determined course of action will result in something not consistent with the policy maker's values and at the same time suggest a course of action that will produce a consistent result.
- If appropriately distributed, information enables others to evaluate the decisions of policy makers, resulting in a distribution of power rather than its centralization. Judgment and experience are largely confined to the individuals who have it. They cannot be disseminated very widely or very easily. Furthermore, judgment and experience tend to concentrate in the hands of the few who happened to be in the right place at the right time: a fortuitous first experience placed them in a position to gain the next valuable experience, and so on. By contrast, information is portable and disseminated with relative ease. It can help achieve consensus by reinforcing an informed opinion with overwhelming empirical evidence or, when Delphi techniques are used, can identify majority views and practices.
- Information can neutralize the effects of articulate but unknowledgeable advocates of other decisions and it can reduce the effects of personal bias and subjective values on decision making.

Having very generally surveyed the advantages and disadvantages of using quantitative information in decision making, we have now to consider the manner in which data should be introduced into the process. Our first concern is with the kind of decision maker the data is to serve.

The intuitive, judgmental decision maker is primarily a synthesizer. He tends to view the problem as a whole, rather than analyzing its various parts. He gathers information in a random, experiential manner and does not worry too much about the sophistication of the available data: values, judgment, experience, and intuition are going to weigh more heavily in his decision than fact. Ironically, he may do this in large part because he is not certain that his data are, in fact, fact. He prefers the incremental/remedial paradigm partly because he is skeptical of the validity of available information.

The information-minded decision maker, on the other hand, believes that analysis--decomposition of the large problem into smaller problems which are viewed individually--must precede synthesis. He believes further that the process of synthesis must be sufficiently detailed to determine the relationships between the components of the problem--which ones are most important, how they fit together, and what their combined effect will be. He prefers the comprehensive/prescriptive paradigm because he feels that by taking all the available facts into account, it reduces risks.

The intuitive, judgmental decision makers stand together as a fairly homogenous class. But there is considerable difference among the information-oriented decision makers. This is because the latter

generally make use of information analysts, and these specialists have different perspectives on how the results of their analyses should be synthesized to guide decisions.

Differences arise among the analysts because when a complex problem is broken into its components, not all parts are readily subjected to quantitative analysis and prescriptive solutions. When parts of a complex problem fall outside the current capabilities of information science, intuition, judgment, and experience must primarily determine their solutions. The difficulty the analyst confronts is how to interrelate this mixture of quantitative fact and intuition to produce a sound composite that will make trustworthy indications to the decision maker. One may describe the conflicting analytical perspectives in terms of three philosophical approaches--purist, holistic, and empiricist.

The purists feel that if enough time and resources are invested, the right answer can be found through analytical efforts. They believe that decisions should not be made in haste. They believe also that information science eventually will be able to supply all the right answers in timely fashion. A good many purists maintain that meanwhile, decisions are better made solely on the basis of intuition and judgment. They do not want decision makers to blame information science for decisions that prove bad because they were made without adequate analytic effort.

Holistic analysts argue that no matter what factors surround a given decision, one must always push relentlessly toward an analytic, systematic approach. Holists maintain that incomplete data renders

sound decision making impossible because there is an essential, organic relationship between the decision to be made and every information component that is relevant to it. So they build analytical models that use the best data available, supplemented by the best-guess estimates of policy makers to substitute for missing data. The holists also incorporate into their models the value judgments of policy makers about the future. Thus holistic analysis synthesizes both quantitative information and judgmental assumptions in producing quantitative results to provide a basis for decisions.

The empiricists agree with the holists in principle. But they argue that models incorporating the value judgments of a given set of policy makers produce results that are useless to those not affected by the political considerations that were fed into the model. This is so, the empiricists say, because there is no easy way to tell how much of the composite information produced by the holistic model is attributable to judgment and how much to empirical data. They believe that analytical models should use only the best empirical evidence available and that assumptions should enter the model only as questions, taking this form: "What does the empirically based model say if we assume this?" "What does the model say if we change our current behavior, as described by the model, in some specific way?" The empiricists argue further that the results derived from their models should be considered as only one input to the decision-making process, in company with a wide order of value judgments, including desires for the future. They believe that empirical evidence should be synthesized before the synthesis of fact and judgment takes place.

Now obviously, there is no simple resolution of these differences. There is some truth in each approach. There also is considerable value in both of our opposed paradigms of the decision-making process. I believe, however, that a number of forces are moving decision makers in higher education away from the incremental/remedial paradigm and closer to the comprehensive/prescriptive paradigm. In general, most of us would like to have more empirical evidence, more quantitative information, to support our decisions. We may look, then, to a wider development and implementation of new planning and management systems. Therefore, the planning and decision-making process itself deserves careful consideration.

We need to consider closely what elements of the comprehensive/prescriptive approach and what elements of the incremental/remedial approach are to be blended together. In doing this, we must consider all the constraints that bear on our decision making. We need to consider both the advantages and disadvantages of using data, as well as the manner in which data and quantitative analyses and syntheses are to be integrated with intuition, experience, and judgment, in arriving at decisions. We must recognize that no one decision-making process will serve for all situations. As problems vary in nature and scope and must be solved in different environments and under different time-frame constraints, so the appropriate decision-making processes vary--and often are unique. Finally, we must keep always in mind that management systems in higher education complement and reinforce, but do not supplant, such decision components as experience, political considerations, and the capable administrator's intuition.

PART III

Building an Information Infrastructure

The management process in higher education is complex and interrelated. It occurs at many levels--department, campus, institution, system, state, and national. While the nature of the decisions made varies greatly from level to level, the decision-making process is essentially the same. A very simplified representation of the major elements in the process and their interrelationships is presented in Figure 1.

Goal Setting

Goal setting concerns itself with focus and impact. This activity is designed to establish agreement on the general areas that will be addressed by the organization and on the kinds of impacts that are to be sought in each area.

Program Planning

Program planning concerns itself with planned outcomes. Planned outcomes are chosen because they are expected to help achieve the desired impacts. But for a variety of reasons, such as unforeseen or misjudged external forces or factors, the planned outcomes may not produce what is desired. Yet from a management standpoint, there is clearly a need to decide on the specific outcomes to which resources will be devoted. Resource allocation involves matching available resources to the activities that are designed to achieve the planned outcomes. These groups of activities, then, that focus on the planned outcomes, constitute the programs that will be undertaken.

SIMPLE PROCESS MODEL FOR

HIGHER EDUCATION MANAGEMENT

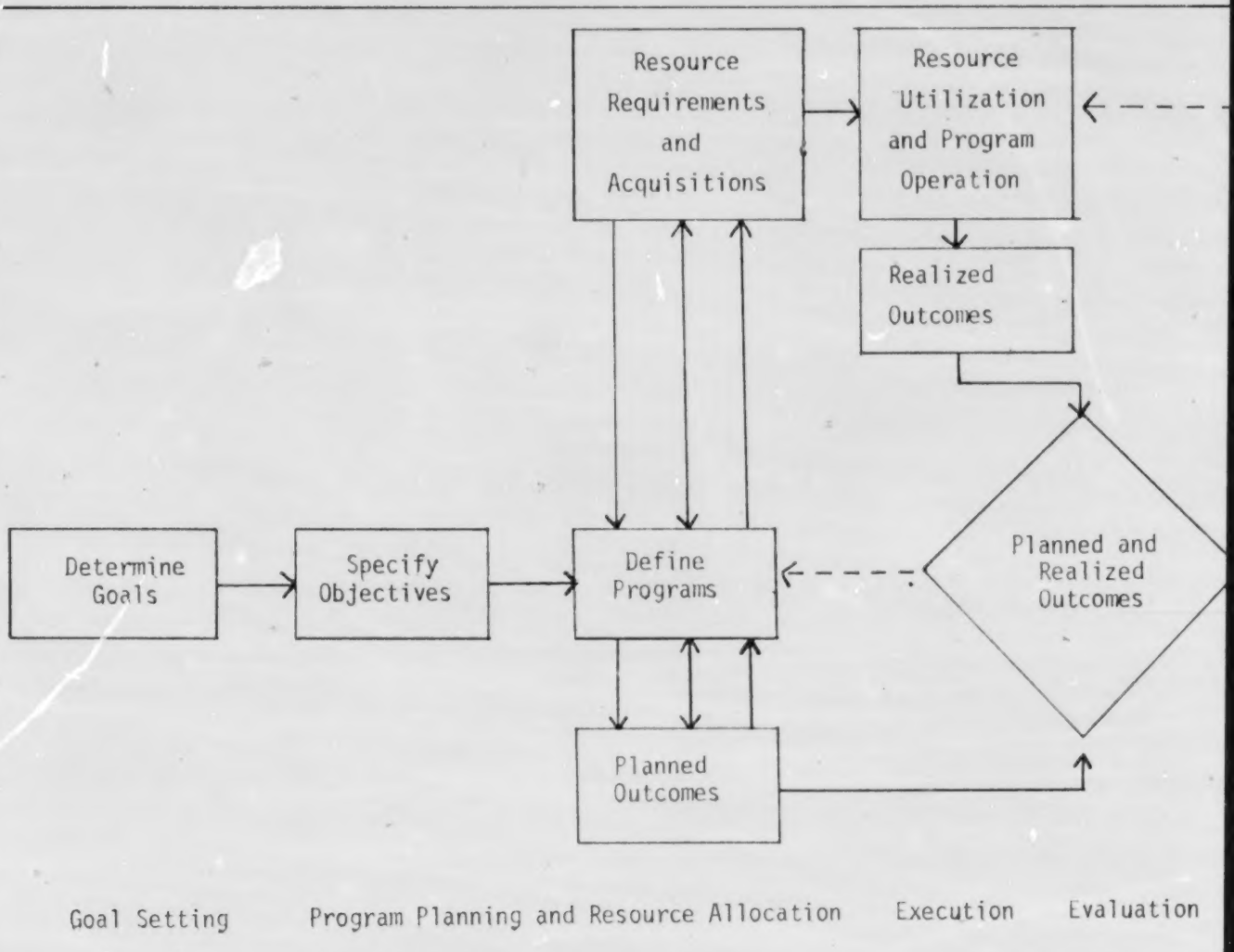


Figure 1.

Execution

Action oriented, the execution activity is concerned with utilizing resources in the best ways possible and with ensuring that the operating focus is always on the attainment of planned outcomes. This activity must work within the constraints of previous decisions and unforeseen circumstances. The result of execution is a set of actual outcomes.

Evaluation

The evaluation activity asks questions not only about outcomes but also about the management process. The first task in evaluation is to compare actual outcomes with the desired outcomes and impacts. To make this comparison, one must also consider planned outcomes and unforeseen circumstances. Actual outcomes may have paralleled planned outcomes very closely and still not have achieved the desired impacts. On the other hand, actual outcomes may have differed from planned outcomes for reasons that could not have been forecasted.

The second evaluation task concerns the individual activities in the planning and management process. Evaluation of actual outcomes, planned outcomes, unforeseen circumstances, and desired impacts may lead to modifications in the planning and management process. These modifications, for example, might involve changes in the management and operating structures or changes in personnel. Eventually these changes will be reflected in the way the goal-setting, program-planning, execution, and evaluation activities are individually and jointly carried out.

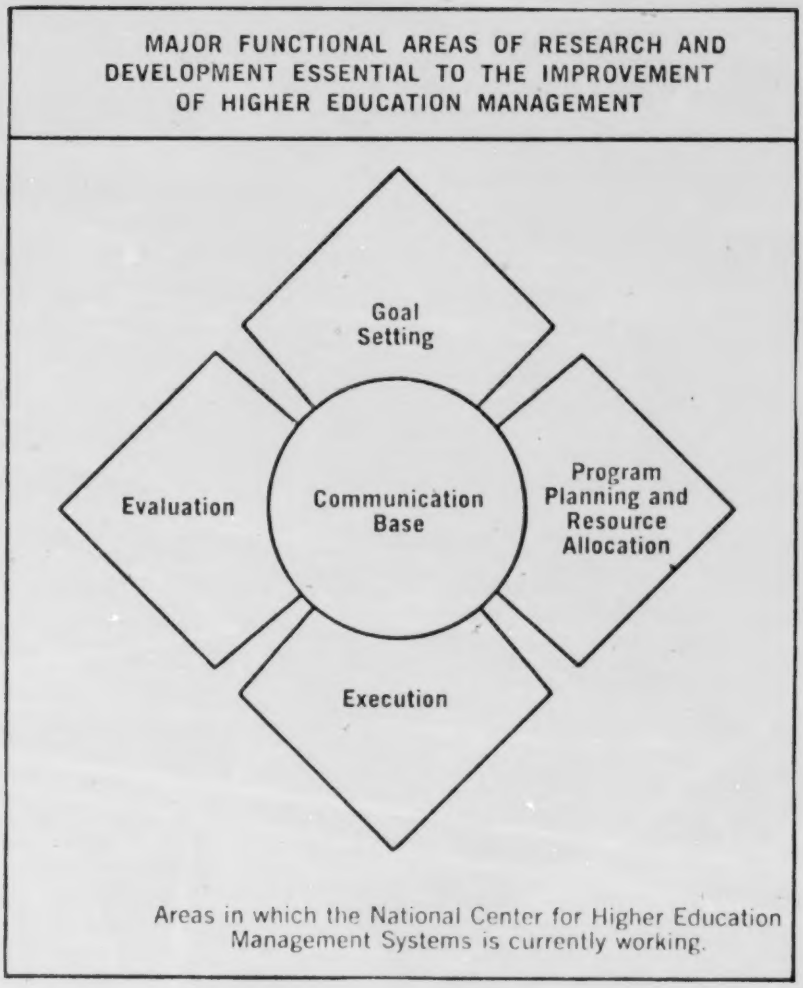
Our study of this process indicates that management can be significantly improved by perfecting these basic capabilities:

1. The ability to transmit or exchange meaningful information on a continuing basis, The Communication Base.
2. The ability to analyze systematically the problems to which solutions are required; the development of college- and university-style planning, programming and budgeting systems, utilizing modern analytical procedures and computer-simulation techniques in the decision-making processes involved.
3. The ability to verify the benefits of higher education through the measurement and analysis (involving both 1 and 2 above) of the outcomes of higher education.

Developing the Capacity to Exchange Meaningful Information on a Continuing Basis: The Communication Base

Figure 1 shows the four major divisions of the simplified process model linked together by arrows, to illustrate the unity of the entire process. These arrows represent communication, information flows. Thus the four areas of management identified are linked by what we at NCHEMS now call a communication base (see Figure 2).

The entire planning and management process in higher education is obviously heavily dependent on the ability to transmit meaningful information both within any level of the management process and between levels, as shown in Figure 3. A common, well-defined communication base that can respond to the information needs of all levels is a necessity. Without the ability to transmit information throughout this highly


MAJOR FUNCTIONAL AREAS OF RESEARCH AND DEVELOPMENT ESSENTIAL TO THE IMPROVEMENT OF HIGHER EDUCATION MANAGEMENT
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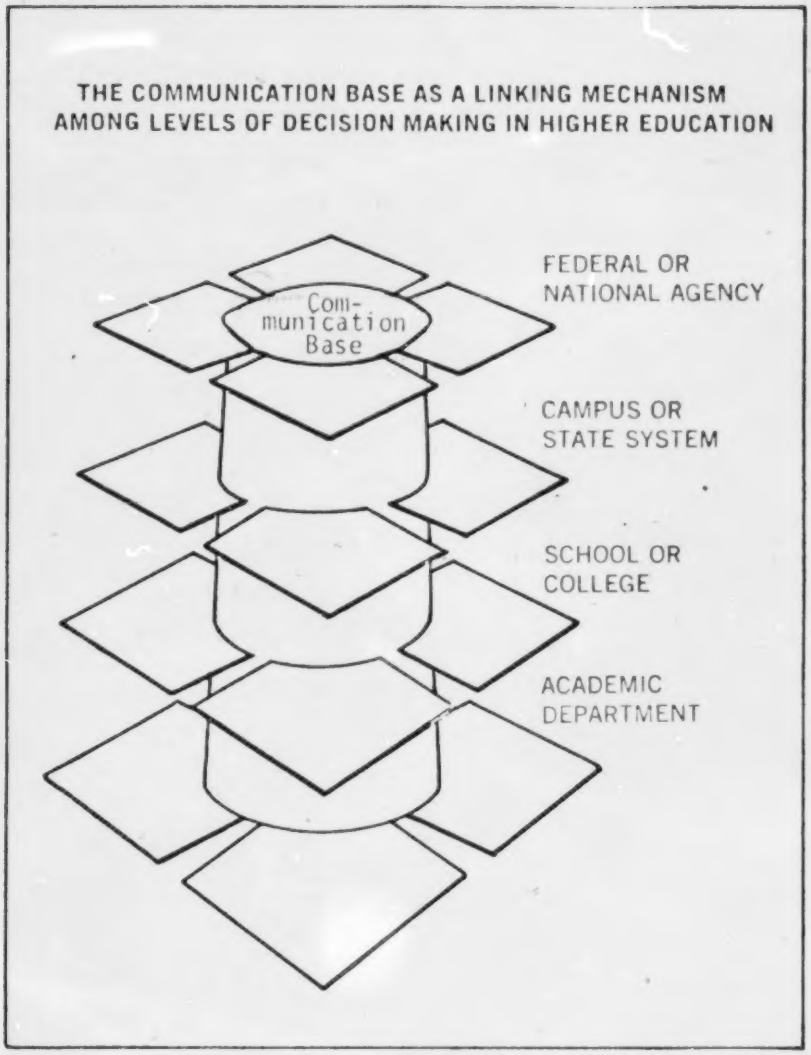
Areas in which the National Center for Higher Education Management Systems is currently working.

Figure 2. Four major areas of research and development linked by the Communication Base.


THE COMMUNICATION BASE AS A LINKING MECHANISM
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Com-
munication
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NATIONAL AGENCY
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COLLEGE
ACADEMIC
DEPARTMENT

Figure 3.

complex and interrelated system, ineffective and inefficient planning and management would result. Since the operational phase of this process resides within the institutions of higher education, the communication base must reside there also. But since the communication base must serve information needs at all levels, it should eventually include the data elements critical at all levels. Thus for institutional purposes, information concerning an individual's academic major at the student level may be quite sufficient. While for national purposes, data on the individual's family income may be required. Clearly, then, a comprehensive communication base, blanketing extensions of each level and at the same time flowing up and down through each level to all others, is essential.

While our ability to transmit information within a level and between levels of management has improved in recent years, it is still very limited. Historically, it has been virtually impossible to obtain comparative information about programs or institutions of higher education. In fact, until recently the exchange of information was believed to be the first step toward homogenizing and downgrading American higher education. Diversity in both type and quality is a cherished ideal in American higher education that we are determined to preserve, because diversity of programs is essential in assuring that higher educational programs will be available to serve the diverse needs of individuals and groups in a pluralistic society. In addition, some administrators fear that the creation of compatible information systems needed for information exchange may bring about inflexibility and undue homogenity in the planning and operation of institutions.

The problem then became to obtain, exchange, and report meaningful information without jeopardizing diversity in type and quality of higher education programs. We need information systems within higher education that at the same time are sufficiently individualized to serve the unique needs of the respective institutions and sufficiently compatible to allow valid inter-institutional data comparisons. How is this possible?

Compatibility: Concepts and Definitions

From this dilemma arose the concept of a lingua franca of information exchange--the notion of comparable information systems as opposed to identical information systems. This concept argues that if a number of institutions and agencies share a common but sufficiently disaggregated data base, data can be aggregated upward according to rules devised by an institution to meet its particular needs for internal management purposes, but that they can also be aggregated upward according to a common set of rules to produce information needed for exchange purposes.

The pieces of data collected by means of a management information system may be referred to as data elements. The discrete data elements used in any two systems must be identically defined if the two systems are to be compatible.

Data elements may be thought of as discrete, irreducible items. Two data elements may be combined in some mathematical manner to produce a derived piece of data, but a pure element cannot itself be divided into smaller components. To illustrate: a student name is a discrete data element; a credit hour is a discrete data element; but a full-time enrollment student is a derived piece of information. The array of data

elements that are collected and filed by a management information system constitutes the data base of that system. When two or more data elements from a system's data base are used to derive a piece of information, that piece of derived information may be compared to a similar piece of information derived from another data base only if both were derived from identical data elements in a precisely identical way. Thus, compatibility of management information systems depends not only on the collection of identical data elements to constitute the data bases of the systems, but also on the standardization of the definitions and formulas used to derive comparable pieces of information from those identical elements.

Schematic explanations of the essential aspects of compatible management information systems are presented in Figures 4-6.

With compatible data bases, institutions can derive information in a manner compatible with other institutions and therefore make valid data comparisons. They can also derive similar information in slightly different (incompatible) ways in order to meet unique institutional needs.

For Example: From a common compatible data base -

A B C

D E F

- an institution may compute its enrollment in accordance with a Full-Time-Equivalent (FTE) student measure unique to its own needs by processing the data elements according to its own conventions:

$$\text{Unique FTE} = f(A, B, F), \quad \text{e.g.,} \quad \text{FTE} = \frac{A + B}{F}$$

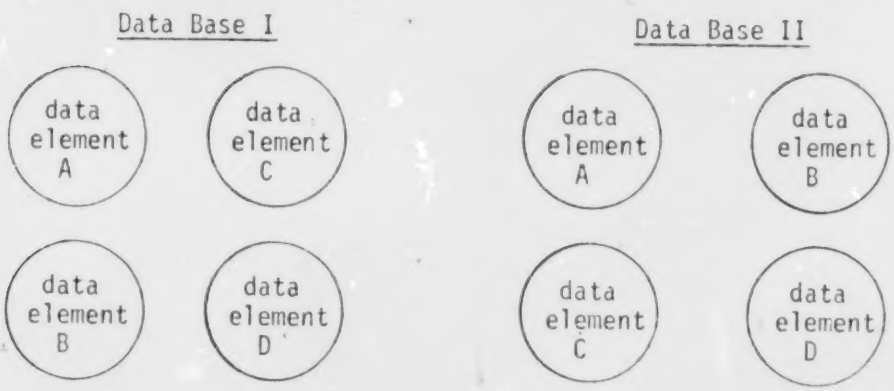

Figure 4. Representation of two identical data bases that make compatibility of the two respective management information systems possible.

Data Base I

$$\frac{A + B}{C} = X$$

Data Base II

$$\frac{A + B}{C} = X$$

Figure 5. Elements from two compatible data bases used to derive two compatible pieces of information.

Data Base I

$$\frac{A + B}{C} = X$$

Data Base II

$$\frac{A + D}{C} = X_1$$

Figure 6. Elements from two compatible bases used to derive two similar but not compatible pieces of information.

Or it may compute enrollment in accordance with a regional standard FTE for comparison with other institutions by processing the data elements according to standard conventions:

$$\text{Standard FTE} = f(A, B, C), \quad \text{e.g.,} \quad \text{FTE} = \frac{A + B}{C}$$

We have established that the degree of compatibility between any two management systems is determined by the degree of agreement concerning the data elements included in the data bases of the two systems, the definitions of those data elements, and the procedures used in aggregating the data elements to derive the information to be compared.

It has also been demonstrated that management information systems may concurrently provide compatible information for comparisons and uniquely derived information to serve unique institutional needs.

In order to put this concept into practice among institutions and agencies, three things are required:

1) A set of standardized definitions for data elements,
2) A set of standardized procedures for aggregating, reporting, and analyzing those data elements, and
3) Agreement on the qualitative aspects involved in comparison.

Standardized Data Element Definitions: A set of uniformly defined data elements is required for the development of compatible data in the participating institutions and agencies and is fundamental to interinstitutional information exchange. In order to accomplish this, a series of data element dictionaries has been developed and is under regular revision.

Standardized Data Structures: If data is to be useful in the planning and management process, it needs to be structured in a meaningful manner. If we are to develop compatible management information systems, exchange information among institutions, and report this information to governing agencies in a meaningful manner, we need a standard means of identifying and describing the activities of higher education and of organizing the associated information. NCHEMS has undertaken to develop several such structures, one of which we refer to as the Program Classification Structure (PCS), which provides a taxonomy of higher education activities that may serve as a structure for classifying various information about the general operational programs of higher education.

Principles and Procedures: Standard procedures and methods are needed to support the analysis of data. Standard methods for identifying, aggregating, and arraying data are a prerequisite for the exchange of data among participating institutions. In those situations in which absolute measurements are difficult or impossible, relative or comparative measures become useful and in some cases necessary, but they too must become compatible. That is, standard data elements and similar procedures for aggregating and presenting the data must be agreed to and used by institutions and agencies involved in information exchange.

While we have made substantial progress toward the development and implementation of these essential elements of a capability to communicate between institutions and to respective governing agencies, setting standards for data definitions, structures, and aggregation procedures relative to higher education is disturbing to many. They mistakenly assume that the

presence of standards means that standardization will follow. The fact is that while standards make it possible to standardize, standards also make it possible to individualize. Imagine a tailor trying to make a suit without a measuring tape. While not impossible, it would be tediously difficult. He could hold the cloth up to the man to get approximate fits and after many alterations probably make a suit that fit well. In making suits for other customers, however, the tailor would probably be tempted to develop several standard size suits and make slight alterations rather than cutting and fitting many times for each customer. With a standard measure and a set of standard measuring locations, however, the tailor can measure each man and make a suit to a nearly perfect fit in one iteration.

Recently, computers and that same old standard measure, the ruler, have made it possible virtually to tailor-make suits by machine to fit individual needs. Some thirty individual measurements of the customer are taken, keypunched onto a computer card, and fed into a computer that controls a laser beam that cuts the cloth to fit the customer's unique proportions. These thirty standard measurements are far more than the conventional custom tailor would make. And when the computer-patterned pieces are assembled, the result is as good as a quality tailor-made suit. Appropriately applied, standards enable us to tailor educational experiences to meet the needs and aspirations of individual students and to reconcile the goals of individual students with the broader goals of society.

Developing the Capacity to Analyze Systematically the Problems to Which Solutions Are Required: Analytical Tools and Procedures

Some draw a distinction between data and information, arguing that data by itself lacks meaning. Data, they believe, becomes information when it is related to an issue, a problem, or some other data in such a manner as to inform. While I do not support this view in all cases, it is certainly true that data must be related to something to become useful information. If the notion of a communication base linking the various aspects of higher education management is to be valid, analysis must be provided that relates the data in a meaningful way to the management problem concerned. Given this notion, then, we may modify Figures 2 and 3 to appear as shown in Figures 7 and 8, respectively.

Each area of the management process usually involves several decision makers and requires coordinated decisions on several levels. The structure of many of the decision problems in these areas is similar. This observation has led to the development of a number of generalized analytical procedures and tools that can be employed in a variety of problem areas. These procedures and tools for analysis help to clarify the problem and often serve to relieve decision makers of the burdensome task of calculating by hand the precise implications of each alternative course of action. Computerized analytical methods substantially reduce the time and effort required for such calculations. Furthermore, the use of these procedures and tools help to establish a common starting point from which decision makers with different concerns can begin their serach for a decision or a plan that is acceptable to all.

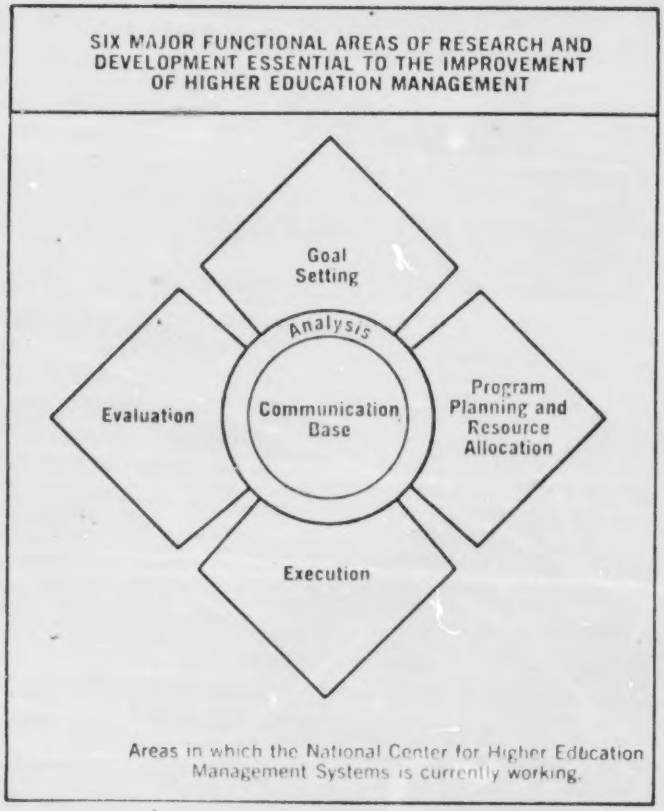
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Figure 7.

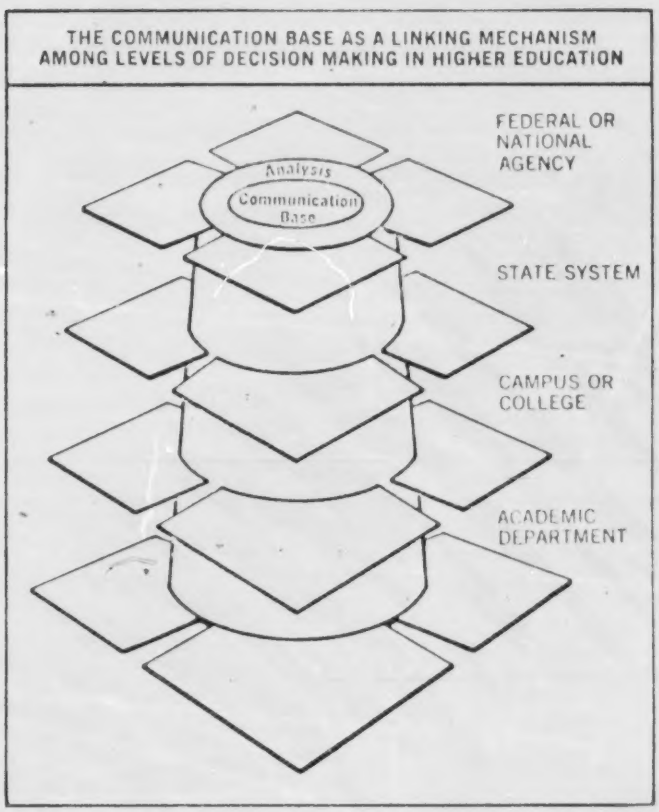
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Figure 8.

These tools should be creatively used in a variety of problem areas. I view the management of the higher education process as primarily an art. The manager is much like an artist in that he is trying to create a satisfying experience for his audience. Of course, satisfaction is many things to many people in higher education. The nuances involved in creating that satisfying situation for a variety of people are as complex as master brushwork. Extending the analogy, we may say that information science is providing the planning artist in higher education with better brushes, better oils, and better canvases.

It is appropriate to acknowledge at this point that many of the concepts employed in the development of current trends in higher education management in the United States have been borrowed from earlier developments by the U.S. Department of Defense. A number of former Defense Department analysts moved to higher education positions in the mid-sixties, bringing with them the benefits of those experiences--some successes and some failures. Most notable was the move to California institutions of Mr. John Keller and Mr. Jim Farmer. They have played significant leadership roles in the conceptual development of tools and procedures now being developed. At least two fundamental differences distinguish the new concepts as applied to higher education from those of the Department of Defense:

- The Department of Defense not only has sought to plan with a heavy outcome orientation but also has held that the organizational control of the programs should generally be dictated by the outcomes as opposed to process. Higher education still

feels that the process is as important as the outcome, if not more so, and consequently organization is related to function as opposed to outcome.

- The Department of Defense is much more concerned with results than is higher education, and thus the department pays attention to environmental or process outcomes only for the purpose of improving results. (This will be elaborated on later.) Higher education, on the other hand, feels that the means may have some very important objectives apart from the end objectives and therefore gives environmental and production outcomes equal attention.

The practical utility of the new management systems concepts has yet to be established. It is true that we have some theoretical understanding of what they can do for use and that sufficient pilot testing and pragmatic applications indicate that these concepts hold significant promise of utility. But there has not been as yet a significant, widespread application of management systems concepts from which we can draw a conclusion about their general usefulness. We may reasonably expect such application and conclusive evidence of tuility fairly soon. Meanwhile, we can assert only the potential or probable usefulness of these concepts.

Program budgeting is an umbrella term commonly used to cover all the new conceptual approaches to systematic budgeting. While advocates of program budgeting push different approaches, claiming many virtues for each, I believe the concept holds promise of enabling higher education to respond effectively to three major accountability concerns:

1. What are the long-term financial implications of a particular program or policy decision? Program budgeting concepts generally attempt to array programmatic and financial information in a way that indicates the long-term consequences of a particular budgeting decision. For example, if we add a new department this year at level of operation X at a cost of Y dollars, what are the projected level of operation and anticipated costs for the department three years hence and what are the work-load and dollar-cost implications for other departments one, two, and three years hence?

   Or, if we employ 20 new faculty this year at an increase in the salary budget of X dollars, what is likely to be the dollar effect on the salary budget five years hence?

   Conversely (in trying to reduce budget size), if program X is reduced or eliminated this year, what will be the overall budget effect for each of the next several years?

2. How can we get an understanding of what we are paying for? The activities and products of higher education are bewilderingly numerous. Program budgeting concepts generally try to develop program structures that permit the aggregation of small activities into larger homogeneous programs aimed at the stated objectives of the institution. The purpose of this aggregation is to communicate quickly what funds are being used for in a program sense as opposed to a resource sense.

3. How do we know that the price of a particular program is reasonable? Could the same program be produced for less money? This concern is both more prevalent and more vexing than the other two combined, for worth is extremely difficult to establish with precision in higher education.

Program budgeting concepts generally help in three ways to evaluate worth:

- By producing compatible unit-cost information to make comparisons of specific products and their costs reasonable as well as possible.
- By relating resources that may be considered to produce either the same outcomes at less total cost or more preferred outcomes at the same cost.
- By undertaking cost-benefit analysis--that is, an examination of the worth of the outcome produced, related not only to its costs to produce, but also to its worth or utility to the purchaser after production. A bacalaureate degree in history may cost $10,000 to produce. If it is deemed to be worth what it costs or more, presumably it will generate sufficient productivity to put back into the system the cost of the original investment plus interest and inflation. If it is not worth its cost, the original investment will eventually erode and the production process will face bankruptcy.

It is easy enough to pose difficult questions. A little more thought is required to identify concepts that will help us respond. But the real task is to produce tools and procedures that will, in fact, provide the

information required. The integrated-effort, joint-product nature of the higher education process in the United States makes it very difficult to devise management tools that actually produce outcome-oriented program planning information. For example, a student majoring in history draws on resources in several other departments in order to earn his degree. Thus a projected change in the production of undergraduate degrees in history at an institution has a direct educational, work-load, and financial effect on several other departments.

However, the complexities are not insurmountable. We at NCHEMS believe we have made a small but useful beginning. The new approaches draw heavily on the communication base standards discussed earlier. Publications describing these tools, both in brief and in great detail, are available. Concepts that have been developed, computerized, and tested and are now in various stages of operation in a number of American institutions and State agencies include:

- A matrix that can calculate either induced course loads or instructional work-loads, to get at the problem of joint production and outcomes.
- Flow models designed to support analysis of student flow, both within an institution and between institutions within a state.
- A Resource Requirements Prediction Model that projects total resource needs generated across an institution as the result of a particular decision or set of decisions.
- A Data Element Dictionary and a Program Classification Structure, major components of the NCHEMS Communication Base.

- A set of Information Exchange Procedures, utilizing the standard data definitions and collection procedures provided by the NCHEMS communication base and comprising:
  - a cost study that uses data from an institution's accounting system, student registration system, and personnel system to determine the costs of disciplines (departments) and degree programs (student majors).
  - an outcome study to identify and collect outcome measures appropriate to an institution. The outcome data are collected through a survey of students, graduates, and the employers of graduates.
  - a listing of descriptive information about an institution's students, faculty, facilities, and organization that defines more comprehensively the institution's characteristics.

A state-level information base and analytic tools and procedures are being developed to assist agencies engaged in statewide planning and coordination of higher education.

Developing the Ability to Verify the Benefits of Higher Education: The Measurement and Analysis of the Outcomes of Higher Education.

One can argue that the outcomes of higher education should be treated like all other factors to be measured and analyzed in the process of higher education management. However, the difficulties involved and the current state of the art require that we give special attention to outcome measures.

American higher education traditionally has planned and budgeted only on the basis of the inputs--facilities, personnel, dollars--consumed in providing education, not on the basis of the outcomes these resources produced. Decision makers have gone to great lengths to find out what programs cost, but they have made and executed plans with little or no idea of what outcomes will result. The historical costs of higher education have been and still are the primary basis for making program decisions. Costs are relatively easy to calculate and the implication in this approach is that cost is a good indicator of benefits. But cost information alone tells nothing about the outcomes and benefits attained by implementation of a particular decision, as administrators well know. There is little argument in American higher education about the necessity of planning and decision making in terms of outcomes. But how do we go about it?

Before addressing this question, we should consider some of the activities involved in planning, decision making, and policy formulation and consider how a better knowledge of outcomes might improve these processes.

First, one might consider goal setting, although it is really not a new idea in higher education. The concept of master planning in higher education was widely accepted a number of years ago in America. Today a great many institutions, state boards, and coordinating councils go through a fairly formal process to lay out missions and goals. Often, goals are defined in great detail; various hierarchies of missions, goals, objectives, and sub-objectives are established. Goal setting is a crucial task, but simply stating goals is not enough. And frequently, goal-setting efforts are deficient in at least two ways.

First, goal statements are often high-sounding but unfortunately unwarranted. For example, a state or an institution may establish the goal of increasing the availability of certified public school teachers. The goal sounds worthy, but it's tragic if no one has stopped to analyze whether or not a shortage of certified public school teachers exists. Too many goal-setting efforts bypass the essential preliminaries, the fact gathering and analysis, required to match goals with the actual needs of individuals and society.

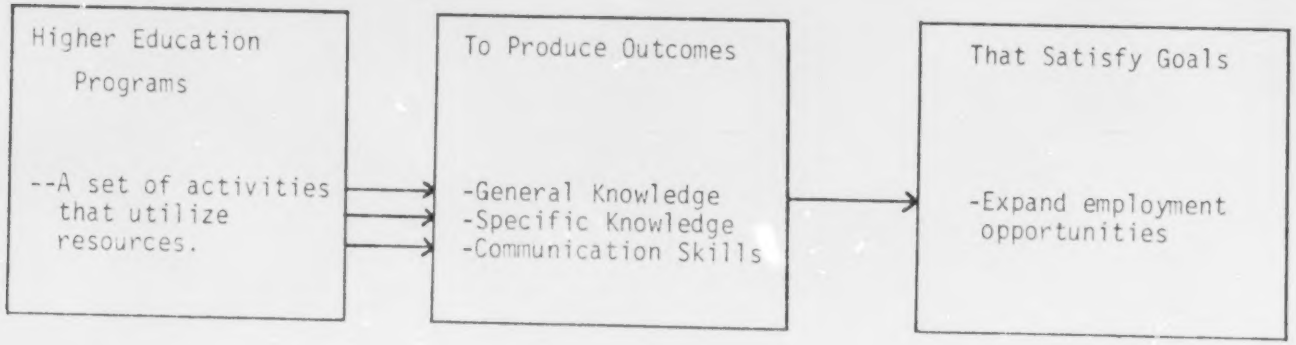
Second, planners have not very often made sure that goal statements are realistic. Establishing a goal without providing means to implement it is an idle exercise. Moreover, we must have some way of determining whether the goal has been achieved--another consideration that goal-setters are inclined to ignore. In this regard, information about the outcomes of higher education will help significantly.

Consider this example of an oft-stated goal for American higher education: "Improve employment opportunities for the residents of the State." We need to translate the "employment opportunity" goal into specific objectives stated in terms of the outcomes of higher education programs. For example, programs can be oriented to improve motor skills, communication skills, and leadership--outcomes related to "employment opportunities." (See Table 1.)

The expression of goals in terms of outcomes is the only way we can compare programs and determine which should be established, expanded, curtailed, or discontinued. The crucial comparison is between the outcomes of programs and the outcomes that best reflect the goals of higher education. Having made this kind of comparison, decision makers

Table 1

Translating Goals into Outcomes



will be able to make judicious trade-offs and judge where resources are to allocated wisely. Thus assessment of the outcomes of higher education becomes the means for relating the programs, activities, and resources utilized in higher education to educational goals.

But conceding that there are probably a large number of programs in higher education that produce outcomes that contribute, for example, to expanded employment opportunities, which ones do we choose to fund and implement? Some programs will cost more than others, but cheapest is not necessarily best. If we can measure or gain qualitative information about the outcomes or benefits of alternative programs, a much sounder decision is going to result. Clearly, then, information about the outcomes of higher education, whether it be quantitative or qualitative, and the identification of indicators of those outcomes, will be useful in making judgments and setting priorities relative to higher education programs.

Another important and related use of outcome information is to facilitate communication between decision makers--that is, between institutions, agencies, and governmental organizations. Each may have somewhat different objectives. Yet one of the most stringent constraints on effective planning and decision making in higher education has been an inability to describe and communicate objectives from one level to another, whether it be from students to administrators, between administrators and faculty, or among the institution, the statewide coordinating agency, and the legislature. The articulation of the outcomes of higher education may be the language in which this vital communication can be achieved.

Finally, a knowledge of outcomes will help determine whether a goal has actually been attained. Program evaluation, for instance, could be conducted in terms of the intended cost/benefit relationship.

Having examined the utility of potential outcome information in decision-making and policy-formulation activities, we have a better understanding of the character of the outcome measures required. We need outcome measures that describe the outcomes of higher education from at least two perspectives: 1) the outcomes of higher education as products (i.e., degrees, new ideas, changes in student behavior), and 2) the outcomes of higher education as an environment in which students and faculty pursue knowledge.

To draw the distinction between these perspectives, consider that an automobile factory can be viewed simultaneously as producing units of transportation (people and goods moved from point A to point B) or as producing vehicles that in addition to other functions--to entertain, provide shelter, serve as status symbols--transport people and goods. The prime objective is of course transportation, but accommodating and satisfying the user in other ways is a strong environmental objective.

Higher education needs outcome measures that describe the environment of higher education as a place for conducting scholarly activities and also measures that describe the outcomes of those scholarly activities. In a pluralistic society such as America, we wish to provide diverse kinds and qualities of programs and settings in which people with different values can be satisfied while pursuing the more common objectives of a degree, a new idea, or an improved skill. In short, we are not a well-ordered,

disciplined society prepared to go directly to a single objective. Americans sometimes want to see and experience some things along the way more than they want to reach the destination.

It should be stressed that outcome measures, particularly those attempting to measure production, must address the concept of value added. We cannot assume, for example, that all skills and abilities of a college graduate were obtained in college. He brought some knowledge with him. The community, his parents, friends, and other associates also contributed to the knowledge he gained while he was at college. Measures of outcomes must be able to express the net value added by virtue of the higher education process.

NCHEMS has developed some measures in each of these areas and some tentative ways of using them in our planning processes. They are described in detail in two studies written by Sidney S. Micek and Robert A. Wallhaus, Outcomes of Higher Education and Higher Education Program Assessment Profiles.

Until very recently, higher education in the United States has not been subject to the competing demands of private enterprise, the humiliations of automation, or the tortures of budget cutting and program termination. Unlike many other service functions in our society, higher education enjoyed a plentitude of resources. Now, of course, the public is calling for more efficiency, for a reduction in the rate of increase in the cost of higher education, and for substantiation of the benefits provided to students and society. One way to comply is to concern ourselves with the outcomes of higher education, to define them explicitly, and to plan programs that will accomplish them efficiently. This word of warning, however: in the efficient pursuit of our objectives,

let's not do to the environment of higher education--that is, its capital resources--what we have done to the ecology in our pursuit of a better material life. Let us not destroy our higher education base, depleting our resources and capabilities for knowledge building, in the headlong pursuit of efficiently obtained objectives for higher education.

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PART IV

Costing and Cost Analysis in Higher Education: Problems and Contextual Realities*

*This section is derived from an address to the North Central Association of Colleges and Schools at Chicago, Illinois, on April 8, 1975.

Cost analysis in higher education embraces a two-fold controversy. There is much disagreement about what techniques should be used. And there is a somewhat more emotionally charged debate about the proper uses of the information produced by cost analysis. Controversy tends to narrow the focus of our attention, of course, and we would do well to keep in mind that costing is but one of the management problems facing higher education. Certainly it is not the only problem being addressed at the National Center for Higher Education Management Systems (NCHEMS), though it is as tough a problem as any the Center has encountered.

Though complex and technical and requiring considerable expertise, cost analysis is not solely the concern of the technically proficient analyst. Determining what uses are appropriate for costing information is a broad policy issue in which academic administrators, department chairmen, and faculty have a tangible interest. Therefore they should have at least a conceptual grasp of this abstruse subject. It is particularly important that they be able to view cost analysis in a realistic, pragmatic light--that they appreciate what the technical experts can accomplish with cost analysis and what the problems are.

Placing cost analysis in its appropriate context involves the examination of these concerns:

- The recent increase in pressures for cost analysis and the motivations behind these pressures.
- The guidelines for cost analysis that have been established at NCHEMS.
- The directions that the development of cost analysis procedures should take in the future.

With respect to recent pressures and motivations, we must first recognize that appropriately or not, the growth of cost analysis in higher education over the past decade has taken place largely in the context of accountability, and more recently in an environment of resource acquisition frustrations. Concern for cost analysis in American higher education dates back much more than a decade, of course. Such efforts have a long history at some institutions and in some States. But as concern for accountability has increased over the past several years, and more lately as serious funding shortages have developed, we find almost every institution of any size and almost every State undertaking some form of cost analysis. In planning, cost information is essential when weighing the relative merits of alternative policies or courses of action. In budgeting, timely cost information is vital when unforeseen changes in policy or available revenue force immediate adjustments in operational spending patterns. Cost information is likewise indispensable for budget control. Beyond these uses, cost information figures heavily in the evaluation of performance. There is a good deal of sincerely motivated and sensible opposition to the unbridled use of so-called cost effectiveness as the primary measure of the value of educational programs and services. But increasingly, it is the yardstick most often relied on by both public and private funders in the United States.

The States as well as the institutions have discovered that costing procedures are expensive to develop and difficult to implement. This general experience of difficulty caused a number of institutions of higher education and States in the American West to decide in 1968 to

mount a cooperative, three-year effort to develop common costing procedures. The intent was to develop procedures that would permit the voluntary exchange of cost information among institutions in Western States. The cooperative program was the forerunner of the National Center for Higher Education Management Systems (NCHEMS). Since its inception, then, NCHEMS has been engaged in costing work and therefore has been embroiled in controversies. The Center has sought to respond in a positive way to the concerns that generate these controversies, developing procedures and products that, taken together, help users to see costing from a proper perspective and help to allay some of the fears about possible misuses of costing information.

But before the procedures and products developed at NCHEMS are reviewed, costing should be defined and the different concepts of costing that have come into use in higher education should be distinguished. Costing, or cost accounting, is the business of determining the cost of units of service. Financial accounting, by contrast, keeps track of expenditures made by an organizational unit or expenses incurred in performing a given function. Costing involves the collection and classification of different kinds of expenditures--salaries and benefits, supplies and services, facilities--during a particular period of time and the allocation of these expenditures to specific units of service produced during the period in question.

The pressures for cost data in higher education have concentrated primarily in three areas. The first is program costing. Traditionally in educational institutions, most cost analysis has focused on resource cost--the cost of salaries, fuel, buildings, supplies, and such. There is more

demand today to know program cost because obviously there is more need to make sound judgments about the educational worth of a program relative to its costs. In the prevailing tight-money environment, the very survival of a program may depend on the ratio of its benefits to its costs.

The second approach to gain favor in recent years is unit costing. Unit cost information permits projection of costs at various levels of operation, development of formulas for allocating dollars, and cost comparisons. The traditional resource cost approach will determine an institution's total salary costs. But that information does not help calculate salary costs at various staffing levels. The average salary, or unit cost, of faculty is required for that. And knowing the total cost of a particular program does not facilitate the projection of the cost of that program at various levels of operation. Again, some unit costs associated with that program are required.

In assessing unit costing, three limitations should be kept in mind:

- In recent years, the calculation of program costs has focused entirely on the instructional function, since those who pay the bills generally view instruction as the prime purpose of education beyond the high school.
- By and large, funders regard the student degree or program-completion certificate as the principal benefit derived from the instructional program. The result has been that efforts to determine unit costs of instructional programs have concentrated almost exclusively on cost per student--which, with some adjustment for noncompleters, equates to cost per degree or certificate.

- Average or unit cost per student is at best a crude indicator for projecting costs of operating a program at various levels. It is less than satisfactory because when unit costs are used to project costs of programs at different levels of operation, at least three important considerations are ignored: the economics of scale, the costs of developing new programs or phasing out old ones, and the marginal costs incurred in adding or dropping students within a given program.

The third and most popular concept is comparable cost. This term must be understood to denote comparisons that have real significance to a particular decision. Comparing the unit cost of fuel oil to the unit cost of coal is of little use in determining which would be more economical. To know that, we need to know the cost per Btu of the heat produced by each fuel. The trouble is that in higher education, we do not have an output unit of measure equivalent to the Btu. We cannot so neatly and reassuringly quantify the benefits, or outputs, or outcomes, or consequences, of education: indeed, we cannot even settle on one general term for them.

Cost analysis which utilizes all three concepts--program costing, unit costing, and comparable cost--will tell us the comparable cost per student by program. NCHEMS, with substantial assistance from numbers of institutions and States, has been trying to use all three concepts. And the Center has had more problems that it bargained for. The most difficult aspect of this work involves the concept of comparable cost. The NCHEMS approach to this question argues that before meaningful comparisons can be made, at least these conditions have to be met:

- The information--the numbers and the taxonomic labels--used in the comparison must be compatible. That is, the information must be produced by standard procedures.
- In making comparisons, factors other than cost and labels must be considered--factors that describe in detail what it is that is being costed. We do not want to fall into the trap of assuming that apples and oranges taste alike because both have been designated as edible fruit.
- The final determinant of whether a comparison is appropriate or not is the decision to which the comparison is addressed. And here many philosophical differences are bound to arise regarding what is appropriate. They are best resolved by carefully examining the nature of the decision that must be made. In this regard, it is well to remember that a comparison may function to discover contrasts as well as similarities. Sometimes we wish to make comparisons that show differences, because we do not want to waste funds on duplications. In other instances, we may want to know whether two things are essentially similar--whether a less costly alternative can be adopted without loss of quality or function. At other times, we may make comparisons only to know where to buy: we know exactly what we want, and therefore need only to compare prices.

A great many individuals and institutions have assisted the cost analysis effort at NCHEMS with advice, funds, staff resources, and participation in step-by-step testing along the way. An impressive array of products is now

available and being used at a large number of institutions. Nonetheless, the Center is quite realistic about how limited the progress has been. NCHEMS is all too aware of the many misinterpretations and innocent misuses of costing information. It is equally aware of the need to develop new kinds of costing data. The more we get done, the more sharply we sense how much remains to be done. To understand why, it will be necessary to retrace some of the steps in costing that NCHEMS has taken over the past seven years.

We may begin with a typical problem in program costing. To estimate cost per student in a history degree program, the analyst has to deal with the fact that history majors are also taking courses in the English department, the math department, and perhaps a dozen other departments. It is an obviously complicated task to develop some convenient method for attributing to the history degree program all the costs incurred by other departments in providing instruction to history majors. To make such estimates, an institution must have developed sophisticated record-keeping systems for both students and courses. In addition, it must have a calculating mechanism.

To meet this need, NCHEMS built into its costing method a concept which has come to be known as the Induced Course Load Matrix--the ICLM. The matrix estimates the credit hour work load that an average student enrolled in a particular program induces on each department of the institution. This concept provides a workable, though certainly not ideal, solution to one of the major problems of determining cost per student major. The ICLM also can determine the average unit costs of student degree programs.

Dividing the degree program costs through by an average credit hour load provides a cost-per-student statistic. But having arrived at these instructional unit costs, an institution still confronts a number of serious problems.

If, for instance, costs per student major are to be compared among institutions, some way is required to equate the degree programs in which students major. This led NCHEMS to develop a taxonomy of subject matter areas, or programs. Eventually the U.S. Office of Education adopted the NCHEMS taxonomy for reporting purposes in higher education. The taxonomy has several shortcomings, however, because tradeoffs had to be made between comprehensiveness and practical working utility. While the current taxonomy contains nearly 300 categories, users occasionally still have difficulty in determining the proper categories for some of their programs. In addition, some categories are still very broadly defined. The taxonomy does, however, provide a convenient if rudimentary mechanism for reporting about discipline programs. And its development has led to further efforts to overcome the difficulties of program costing.

Instructional costing was given top priority by the institutions and agencies supporting and working with NCHEMS. But they were not long in directing the Center to expand its costing approach to embrace all institutional activities. Accordingly, the NCHEMS Program Classification Structure was developed to categorize all of the programs and activities of institutions of higher education. The HEGIS Taxonomy of Instructional Programs was built into the PCS to accommodate the instructional mission of institutions. But research and public service programs--libraries,

museums, security, administration, and so on--also had to be included. It took two and a half years of study and consensus making to develop the NCHEMS Program Classification Structure. It is revised from time to time to accommodate new developments and to correct problems discovered in operational use. While imperfect and incomplete, the PCS is a usefully comprehensive, management-oriented structure to which costs and a good many other important pieces of information can be attached.

The fact that both the HEGIS taxonomy and the PCS defined programs only in crude terms made it probable that cost comparisons utilizing them would be misleading. The history programs of two institutions are not necessarily the same in every significant respect just because they have the same name and fall into the same PCS category. Before the costs of these two programs can be compared meaningfully, their differences must be identified. NCHEMS therefore developed the concept of Program Measures. With such measures, describing program objectives, intended target and beneficiary groups, expected activity levels, estimated resource utilization, and expected outcomes, the extent of differences among programs lumped in the same PCS category can be determined. If the differences are substantial, perhaps cost comparison should not be made at all. If the differences are only slight, they can be taken into consideration judgmentally when cost comparisons are made.

Let us return now to how valuable it would be to have in education a unit of measure such as the Btu. Grades and kinds of coal can be differentiated in terms of a number of characteristics. But for cost comparison purposes, the true test of a given sort of coal is the amount

of heat, the number of Btu's, it yields per ton. So if the price is the same per ton, hard anthracite coal is better than soft bituminous coal. In the same way, the true test of a program in higher education is the benefit or value that it adds to the student and to society.

Over the past five years, NCHEMS has spent nearly $500,000 trying to devise methods for quantitatively describing, however crudely, the benefits or outcomes of higher education. Some of the Center's more promising research ideas are just now being put into practical use. But much more research is needed. Measuring the outcomes of higher education is still in a primitive state. Probably we will not be able to measure these benefits satisfactorily for many years, if ever. But so long as the possibility remains, the effort ought to be made. The ability to quantify some outcomes of higher education, however few, will have positive accountability value. Such information can be used without diverting attention from or slighting the host of subjective outcomes that must be preserved and fostered.

In any case, NCHEMS has diligently tried to find ways to measure the outcomes of higher education, and the effort is not slackening. A problem encountered early was the necessity to distinguish between intermediate and final outcomes. Again, consider a simple case in point. Every institution operates a library, which has specific and often significant impacts on most of the other educational activities of the institution. Obviously, if libraries did not contribute to the outcomes of higher education, they would not be funded. But mainly they produce intermediate outcomes: their contributions to primary programs of instruction, research, and public service are indirect. It is easy enough to total up the costs of library

services. But when NCHEMS began work on measuring outcomes, there was no established way of allocating those costs, or the costs of other support programs of the institution, to the primary programs that produce final outcomes. Such allocation procedures would make it possible to compute not only the direct costs but also the full costs of instruction, research, and public service.

These challenges led NCHEMS to a large research effort, referred to as Cost Finding Principles. This project undertook to empirically examine hundreds of different ways of assigning support costs to the various primary programs. A set of allocation procedures was designed to be consistent with all of the other pieces of the costing puzzle that the Center had developed and to be suitable for wide use. Admittedly, most institutions find these allocation procedures, as well as the other costing procedures, far from easy to implement. They require that an institution's accounting system meet rigid standards--standards that many institutions have not yet been able to meet to their own satisfaction.

NCHEMS therefore cosponsored the Joint Accounting Group--a cooperative effort by the National Association of College and University Business Officers, the American Institute of Certified Public Accountants, and NCHEMS to develop new accounting guidelines and procedures. The Joint Accounting Group reached consensus on uniform definitions of accounting terms and standardized categories for the classification of transactional financial data. As colleges and universities adopt and implement this group's recommendations, it will also be easier for these institutions to use the costing procedures and products developed at NCHEMS.

Having developed an interlocking series of products and procedures to determine and display institutional costs, NCHEMS next looked at factors that could substantially affect institutional costs. Of the Center's many efforts in this respect, three may be taken as representative examples. The first is called the Higher Education Finance Manual. One of the many products developed in conjunction with this project was the so-called source/use matrix. In oversimplified terms, this matrix allows an examination of the tradeoffs that may be possible under given restrictions. For example, differing restrictions on use, many of them severe, often are attached to the various kinds of funds which come to a particular institution. If these restrictions are not kept in mind, a misleading interpretation of uses of funds can be made, with resulting distortions in costing information.

The second factor that can substantially affect costs is student choice. To provide a wide range of program choices to students, individual institutions must surrender some control over program costs. If students swing unpredictably towards a particular program, the costs of both that and other programs will be affected. To calculate the impact that shifts in student choices and changing student enrollment can have on program costs, NCHEMS developed the Student Flow Model and the Resource Requirements Prediction Model.

A third institutional costing factor is faculty. Quite properly, the faculty represents the single biggest cost item in the typical institutional budget. Therefore it is especially important to equitably

distribute faculty costs among the various programs. This distribution is of major concern in complex institutions where faculty are expected to engage in diverse yet jointly productive activities. The Center's Faculty Activity Analysis project has developed workable procedures to help institutions distribute their faculty costs.

After five years of research, pilot testing, and achieving consensus among potential users of it products, NCHEMS made a preliminary effort at information exchange among institutions. A number of practical implementation problems soon developed. Previous pilot-test activities had uncovered a plenitude of problems. But since NCHEMS staff had been working with a small group of institutions, these problems could be overcome on an individual basis. Now, however, solutions had to be found that would be workable in a large number of institutions. Computer software had to be developed that would be suitable for different types of computers and different operational data systems. Manuals had to be written in sufficient detail to enable any institution to follow the prescribed procedures. People had to be trained. By comparison with its previous activities, the Center found these undertakings immense. For example, about 1,000 persons took part in just one series of training seminars in the spring of 1975. The NCHEMS Information Exchange Procedures (IEP) have been modified as a result of earlier pilot tests and new approaches to on-campus implementation problems have been developed. Widescale implementation of IEP is under way.

In spite of the Center's best care and effort to develop cost analysis procedures and products of high quality, they have distinct limitations. If they are used improperly, the numbers produced will be misleading. Accordingly,

NCHEMS has formulated guidelines for the use of its cost analysis procedures. Here are some of them:

- These procedures produce estimates of costs incurred by the institution. But they tell us nothing about the costs incurred by students while attending school, such as room and board, tuition, fees, books, and foregone income.
- These detailed program costs are intended primarily for internal management use. Much of the information generated by the cost analysis procedures is too detailed and too disaggregated for use by decision makers outside the institution.
- Before cost comparisons are made, three conditions must be satisfied: 1) The information to be compared must be compatible--that is, produced by the same procedures. 2) The programs to be compared must be categorically alike and their specific similarities and differences must be adequately described by program measure information. 3) The decision to be made as a result of the comparison must be clearly identified.
- NCHEMS cost analysis procedures do not ignore the problems of complex institutions, and indeed some complex institutions have used them. But the procedures are at present heavily focused on instructional costs and they cannot at this time enable us to understand joint cost relationships in complex institutions.

- These procedures are designed to estimate total and average costs. They tell us nothing about marginal costs, or about opportunity costs to students, or about the costs to students of different educational alternatives.
- By themselves, total or average costs are of little value. The outcomes or benefits that accrue as a result of these costs must be taken into account when costs are compared. Moreover, knowing total and average costs is not so valuable as understanding the factors which caused these costs to be what they are.

NCHEMS has been energetic in its efforts to make the limitations as well as the capabilities of its costing procedures widely known. Regrettably, there are those who still do not understand or who disagree with these NCHEMS guidelines, and so use the procedures as they see fit. This leaves NCHEMS with only two alternatives: to stop the abuse by abandoning the whole cost analysis effort, or to further refine and develop the procedures in an effort to overcome their limitations and minimize misuse. NCHEMS is convinced that the first alternative is impractical. Politically, the demand for this type of cost analysis is not going to disappear. If NCHEMS does not go on with this work, it seems likely that State governments or the federal government will continue it. In view of this probability, the NCHEMS Board of Directors, more than half of whose members represent institutions, has concluded that it is imperative for the Center for move forward in the cost analysis field.

Demands come from several quarters for better cost analysis. The issue boils down to this: Will we in higher education improve cost analysis ourselves, or will we surrender the task to government agencies and so invite them to delve further into the management of institutions?

PART V

The Role of Computers

Entranced by the ability of computers to store large amounts of information and make it available quickly in a variety of forms, many managers wish to put everything into the computer. Because the costs of computing and storage have gone down so rapidly in recent years, we tend to think of such service as virtually free. But we should look beyond the direct costs of computing and storage to other costs not usually taken into account. The following sets of questions will serve as useful guidelines in curbing the insatiable appetite of computers and management for information:

1. How important is the decision for which the information is sought? Is it a $100 decision, or a $1,000,000 decision?
2. How often will the decision be made? Once a month? Every five years? If the decision must be made frequently, perhaps relevant information should be computerized. If the decision occurs every five years, the computer may be useful in an ad hoc study, but it seems unlikely that one should maintain an active, regularly updated computer file of data to help make it.
3. What precautions must be taken to preserve confidentiality of personal information in the files, and at what cost? What will be the consequences if that confidentiality is breached?

4. What is the total cost, direct and induced, of getting the information and doing the analysis? This figure should include the cost induced on the providers of the information, for their time is valuable.
5. Finally, is the value to be derived from the decision greater than the cost of getting the information?

As a matter of routine, most American universities have a series of operational data systems, maintained by computers--accounting and payroll systems, admissions and registration systems, and classroom and class scheduling systems.

Their primary purpose is to support day-to-day administrative decisions and to carry out the many operational routines necessary for efficient, smooth university operations. While these systems have not reached a state of perfection, they present relatively few major problems in operational use. However, numerous difficulties are encountered in extracting data from these operational systems and making it available in convenient form to support management and policy decision makers. In trying to bring information to bear on policy decisions in higher education, we have found that the interface problem, or the crossover problem as we call it, involved in using operational data systems is significant.

Naturally, we would like operational data systems to be designed as integral parts of a comprehensive data system. Unfortunately, many considerations make this difficult:

- Operational data systems are designed to perform operation functions under a given set of policies. Management systems are designed to determine impacts on operations resulting from a variety of different policies. The cost of operational data systems that would provide that dual capacity would be enormous. The conversion of operational data systems is a significant factor.
- Operation data systems are generally under several different jurisdictions, in many cases for good reason.
- Policy management problems vary rapidly because of external forces, so it is difficult to know what information will be required next and in what form.

In view of these problems, our approach has been to:

1. Develop a capability to maintain a common set of data element definitions and to understand each.
2. Develop a set of structures--program, activities, outputs, and such--in which standard data elements can be placed to produce meaningful information.
3. To develop and maintain data bases for operational purposes and to support recurring policy decisions.
4. To develop analytical procedures that will enable us to use data bases together with the ad hoc collection of other data as needed in addressing non-recurring policy questions.

5. To consider the computer as a large calculator--as an extension of our memory and our ability to undertake complex analyses quickly.

We do not consider comprehensive, integrated computerized information systems for universities a practicality at the current time. Even if they were, we would first have to solve the problems of autonomy and jurisdiction and preservation of the confidential nature of personal information.

SUMMARY OF REMARKS MADE IN PRESENTATION

Dr Lawrence indicated that universities in the United States had been forced to respond to the public's demand for accountability partly because they had not kept sufficiently in touch with the public's feelings and perceptions of the university. In so doing there had been some reduction in the freedom of institutions to create an environment of academic enquiry. He did not believe that the universities had badly managed the resources thrust upon them during the period of rapid expansion. The development of management information systems had improved the utilisation of resources to some extent. The creation of NCHEMS had also put pressure on presidents but the Center would represent the vast majority of the institutions in its philosophy that if the institution did not develop information systems co-operatively State budget officers would do so.

Dr Lawrence outlined the context in which NCHEMS fits in the development of management information systems in USA. The National Center for Educational Statistics (NCES) collects a large amount of information from each institution and compiles a statistical report on post-secondary education. Information was also collected by other organisations which give money to universities, such as the National Science Foundation, the National Institute of Health, the National Institutes of Mental Health and the Defence Department. NCHEMS was gradually persuading these organisations to consolidate their collection of data through NCES. Since NCHEMS represents 3200 institutions it has exerted substantial influence on what information NCES collects and how it is collected and analysed. The standards and procedures produced by NCHEMS had been adopted by NCES.

Each State in USA had an Agency which distributed funds to tertiary institutions in that State. For many institutions the total instructional budget would come from the State Agency, which required a great deal of information in order to make a recommendation concerning a budget. NCHEMS was working with these agencies to develop a State-

level information base that would enable the Agencies to allocate resources successfully and to carry out their responsibilities for comprehensive planning of provision of post-secondary education services to the State.

NCHEMS was concerned with management information systems. The College and University Systems Exchange (CAUSE) was concerned with operational data systems. CAUSE had only a small staff and offered training programs in systems design and maintained a library of systems which had been developed by member institutions. A university seeking to implement a new system (e.g. student record system) could contact CAUSE, specifying the characteristics that would be desired in the new system and receive from CAUSE details of systems available which closely match these characteristics. The university would often make modifications to adapt the system to their purposes.

Arising out of the work of the National Commission on the Financing of Post-Secondary Education a national data base had been set up containing all the information collected by NCES and available through on-line access. However, NCHEMS had been unsuccessful in getting NCES to include data from the Bureau of Census. NCHEMS had developed their own data base which combined the data from NCES with data collected by other national bodies, including the Bureau of Census so that they have higher education, demographic and student financial aid data available together for analysis purposes.

NCHEMS is made up of the institutions and the State Agencies of higher education across USA, with institutions having the major representation. It is governed by a Board. Most of the funds come from the National Institute for Education but considerable funding also comes from other federal agencies and private foundations. The total staff is about 60. The main focus of the work of NCHEMS was resource allocation aimed at convincing funders. Dr Lawrence indicated that education in the United States was putting only a small proportion of funds into research and statistics compared with other areas.

About five years ago the resource requirements prediction model would cost an institution about $35,000 to implement, mainly because the operational data systems were inadequate to produce input data for the model. The costs now were about $3000. The usual approach in universities was to develop operational data systems within the traditional jurisdictional structures in an institution. NCHEMS had developed a data management system to extract information from the operational data files to build the management information file.

An alternative approach was to develop a totally integrated system. However, it was difficult to get officers, such as the Registrar and the Admissions Officer, to give up existing systems that they knew and had control over, and to go to a massive file built from all operational units. It was also necessary to develop a generalised report generator to get operational data out and this was very expensive. In 1969 Ford Foundation gave a grant of $5 million to Stanford University to develop a total information system. However, five years later it was abandoned, partly because of substantial technical difficulties but mainly because of jurisdictional disputes. Dr Lawrence considered that with the advances in technology it might be feasible to implement such a system in a new institution but would not recommend it.

A third alternative was to keep the operational files quite separate and periodically provide output from these files for the management file. This had the disadvantage of needing to maintain the management file which would also get out of date. Most institutions are at present in the position of building a separate management file but usually by pulling off data from the operational files and analysing this data using calculators. Indeed all NCHEMS packages can be operated using calculators.

SUMMARY OF THE MAIN ISSUES RAISED IN DISCUSSION

Dr Lawrence confirmed that the data element dictionaries and program classification structure had been widely accepted as there was little problem in relating data from the various operational systems (e.g. to obtain cost per student). NCHEMS was now revising the taxonomy for disciplines within the program classification structure to try to keep pace with the development of new programs and activities in higher education. The program classification structure did have provision for an institution to include course numbers if they wished to go down to that level. NCHEMS did not encourage this but the State of Florida was seeking to develop a course classification structure by giving every course in all their institutions a common number.

Dr Lawrence indicated that he considered that the development of management information systems for higher education would not have developed to the present stage had it not been for public pressure. Earlier attempts by institutions to undertake major cost studies into their own internal management such as the California Big-Ten Cost Study had been largely unsuccessful because of public and faculty reaction against increased spending on administrative costs at a time when resources were plentiful. However, public reaction later changed. Part of the reason for management efficiency and accountability in USA was because about 50% of the cohort were in tertiary education compared with about 18% in Australia. Another reason was the need to respond to social mandated programs by supplying information about ethnic minorities and women, both in faculty and students, to the Office of Civil Rights. In USA budgets had to be defended directly to the legislature, but there were multiple sources of funding. Other possible indications that Australia might experience similar pressures were that the Universities Commission was starting to ask the same type of questions as were being asked in USA about 1966 and this year Australian universities have seen a break from the triennial funding. In 1966 higher education in USA went from a two-

year cycle to a one-year cycle and this has continued. Australian institutions are now recognising the problems of "incremental creep" or "ageing" as it is called in USA. Ageing had become such a problem in USA that some institutions had had to terminate tenured staff partly because they had given tenure too quickly and too easily during the period of rapid growth. In this period institutions were forced to respond to demand by students and the legislators and so not enough time was available for proper academic planning and staff recruitment.

Another problem in USA, not apparent in Australia, arose because most of the capital construction during the 1950s and 1960s was built on borrowed money and buildings were amortised over about 30 years. When the projected enrolments did not eventuate institutions have not had the revenue to pay their debt service.

There has been some discussion in USA about early retirement because the public cannot believe that this will save public money. Some transfer of staff between institutions had taken place but there were now few positions becoming available. Some institutions have also been examining the possibility of transferring staff from one department to another. Some joint appointments had taken place but universities are mainly looking to part-time appointments of qualified people in the local community. Faculty were starting to form unions although there was some uncertainty as to the position of tenure in negotiated contracts.

SURVEY OF MANAGEMENT INFORMATION SYSTEMS IN AUSTRALIAN UNIVERSITIES 1975

A.W. Findlay, Deputy Registrar, Macquarie University

A management information system might be defined as a system designed to provide information to assist management decision making aimed at reaching objectives. Management Information Systems (M.I.S.) have evolved out of the scientific approach to management, the development of which has accelerated rapidly since 1950. To a large extent this has been made possible by the advent of the electronic computer and its rapid development. The computer offers the ability to store, retrieve and transform large amounts of data, as well as to program decisions based on information feedback (e.g. inventory control) or on rules (e.g. payroll). It also provides the computational ability to make much more use of the tools of management science, such as linear programming, simulation and probability theory. This report seeks to review management information systems in use or planned in Australian universities.

Details of computer-based management information systems in use or being developed in each university are set out in Appendix 1. Most universities are now using or planning to use computers to process transactions such as employee time sheets, subject examination results, library book loans and invoices to produce operational reports such as payrolls, notification of examination results, overdue loan notices and cheques. In the initial transition between manual and machine methods for processing these transactions most institutions developed separate data files for each main operating system, e.g. for enrolments, examinations, payroll, accounts payable, accounts receivable. New systems being developed appear to have more broadly-based data files. Only two universities, Monash and A.N.U. are seriously considering utilising a generalised data management software package. Few universities are using on-line enquiry and updating though others indicate that they are moving in this direction.

Little use is being made of management science or operational research techniques, such as critical path analysis or simulation. La Trobe University is using the critical path method for certain aspects of the building program and is examining possible use in other areas such as graduation functions. Four universities are using simulation models for some aspects of planning as shown in Appendix 2. Adelaide and Macquarie have models to project student numbers. Monash, Melbourne and Macquarie have models to project academic and non-academic staff. The most extensive model is the 'student-driven' computer-based model developed by Macquarie to project student enrolments, graduates, EFTS (or WSU) by School and field of study, course (subject) enrolments, academic and non-academic staff and teaching space needs.

Some comparison with the situation in U.S.A. is possible through a survey conducted early in 1974 by Dr Mann, Director of Management Information Systems at the University of Illinois. This survey revealed that about 70% of the 422 institutions which responded were planning or implementing a computer-based management information system including 41% engaged in partial or full operation. About 85% of respondents were using at least one of the three management approaches: models (45%), planning, programming, budgetting systems (41%) and institutional research (74%). The reasons given for beginning computer-based management information systems were, in order: to improve internal management, to support other management tools, to meet State or Federal reporting requirements, to make better use of hardware and software.

No detailed cost/benefit studies have been undertaken by any university with respect to the provision of management information.

Brief details of the academic and financial organisation and reporting structure within each university are set out in Appendix 3. For all universities there is a Council or Senate as the governing body which usually has amongst its committees, Finance and Buildings.

The structure of the senior academic body varies from the traditional Professorial Board to newer-style Academic Boards. Academic decisions are usually made after discussion through various committees. The Vice-Chancellor is the chief executive officer and is often assisted by one or two Deputy Vice-Chancellors, usually one assisting in academic matters and the other in administration. This split is then often carried through to the Registrar and Business Manager or Bursar.

An outline of the planning mechanism of each university is set out in Appendix 4. Many universities have a planning or development committee. The annual allocation of resources is usually made by the Vice-Chancellor acting on advice from senior administrative staff or advisory committees.

Details of management or analytical reports supplied within each university from the administration to the Head of Department or Office or higher level or to outside bodies or provided to the administration by Heads of Departments, Deans or persons in similar positions are set out in Appendix 5. Some of the reports included are probably more operational than management. In addition to these reports each university supplies annually to the Universities Commission detailed statistics related to student enrolments, staff numbers, library and assignment of space. Several universities and the Commission have attempted to prepare tables comparing such things as departmental costs/WSU but such comparisons have had limited reliability and value because of the lack of standard classifications between universities, particularly in the area of faculties, schools, departments, fields of study and disciplines.

As part of the triennial submission to the Universities Commission each university has to prepare estimates of student and staff numbers. Requests are made for recurrent funds and building programs. Information must also be supplied on the utilisation of teaching spaces. From time to time other statistics have also been requested by the Commission. Universities have also participated in Project SCORE,

out of which should be produced a comprehensive report of the utilisation of resources, manpower and finance on research and development undertaken by and on behalf of Australian institutions in 1974. In recent years the Graduate Careers Council has been co-ordinating the collection of the first destinations of persons completing degree or diploma programs.

In the student enrolments area reports produced by universities mainly relate to various enrolment statistics and subject enrolments with some universities preparing forward enrolment estimates. Almost all universities use a computer to produce most reports. All universities are preparing student load statistics and most seem to use this to assist in academic staff and budget allocation. Average class size is a statistic rarely used. Most universities produce statistics of the examination pass rates in subjects to be used to review results, though few produce reports on the progress of student cohorts. The '1961 Study' is the latest comprehensive report available on graduation rates in Australian universities. In a sense the input into the various programs offered by a university are known but few know the output, i.e. the number of graduates from that input. In addition to the table on entry qualifications completed for the Universities Commission, most universities prepare other reports analysing the academic background of new students. Some prepare statistical reports on the relationship between entry qualifications and university performance (mainly first year) as a basis for reviewing their admission criteria.

Various universities produce reports related to the confirmation or renewal of staff appointments. The generalised interrogatory system developed by Monash to produce a wide variety of staffing reports would appear to be worth consideration by other universities. Almost all universities report maintaining a staff establishment register (about half use a computer to do so) for control and future estimates purposes. Four universities collect annually from Departments the class contact hours for academic staff and use the

information as a guide to allocating new positions (and in one case for disestablishing existing positions). A few universities indicated that they were evaluating duties and reponsibilities of non-academic staff. Study leave forecasts were prepared by some universities.

All universities produce reports relating to the Salaries Budget for financial control (about half use a computer to do so). Budget control reports are produced about monthly showing in general budget, expenditure, commitments, balance under each expenditure heading. Reports are produced of investments to enable reviews to be made, usually by an investment committee or finance committee. Income and expenditure reports are produced for recipients of grants and for the grantors. Universities need to prepare quarterly assessments of funds required against capital grants to request payment of grants.

Library reports have been divided into reader services and technical services statistics and other. Loan statistics are mostly manually extracted though some universities are extracting data from computerised circulation systems. They are used mainly for studies of work load. Few universities extract statistics by subject area to give a measure of the use of the collection. Acquisition and cataloguing statistics are used in studies of work flow. A number of universities indicated that the Librarian prepared an annual report including statistics. In addition to statistics supplied to the Universities Commission, each university supplies more detailed statistics which are published in "Australian Academic and Research Libraries".

Details of the utilisation of teaching spaces are supplied to the Universities Commission in the triennial submissions. Some universities report that this information is extracted more frequently to examine efficiency and review space needs for classes. A few universities indicate that reports are prepared on the assignment of space by department or office to review allocations. Universities report usage of their computers but, with one exception, none have indicated that reports are collected of use of any other major equipment.

Student/academic staff ratios in each department appear to be used in most universities as a guide in the determination of academic staff establishment. The University of Queensland prepares reports of weekly teaching contact hours per academic staff member together with estimates of other time spent in teaching and research. A few universities prepare reports showing recurrent expenditure/EFTS (or WSU) and nett assignable space/EFTS by department.

No university reports preparing a program budget or information on the recurrent expenditure/graduate of a program.

Comments

Within each tertiary institution there is a need to collect quantitative information to assist in the decision-making process at various levels of management. Often this 'need' is imposed by outside bodies such as the Universities Commission. As it appears that growth of universities will slow down in future, the role of universities may change and the level of support may decrease, decisions will need to be made as to which of a number of desirable academic programs should be mounted and perhaps whether any should be dismounted. Although subjective academic judgment must be involved, one of the relevant factors in any decision will be the relative cost of programs. Some work has been done (e.g. by the National Center for Higher Education Management Systems (NCHEMS)) on measuring the outputs of a program but it is difficult to quantify qualitative judgments. Universities may therefore need to look at establishing these costs, such as in a program rather than the present operational budget. It would be worth investigating the applicability of the resource requirements prediction model (RRPM) developed by NCHEMS at WICHE; perhaps as a co-operative project involving a number of institutions as much time and effort would be involved. Cost/benefit studies of providing this information need to be carried out. Universities may also need to examine whether there are potential economies in their operations. This would involve a critical review of teaching

methods, staff teaching load, level of support and service staff and utilisation of space.

It is important for consideration to be given as to how data is organised so that it can be readily available for present needs and future planning, so that duplication of effort is avoided and so that inter-relationships between the various sets of data can be readily manipulated. In this regard the work of NCHEMS in the area of the data element dictionary and the program classification structure warrants careful consideration. A joint committee of the AVCC, the U.C., the A.B.S. is currently working on a data element dictionary for students as part of a project to collect statistical data on students by each university supplying machine readable unit records for each student.

A total computer-based management information system is probably an illusive and impractical goal. However, through the processing of operational data useful information can be supplied for management. If a modular approach is used, sub-systems, such as student, staff, fiscal, library, facilities can be developed separately but the lines of responsibility for determining the data elements to be held need to be established. Perhaps more effort could be directed towards co-operation between institutions in the development of computer systems. Problems experienced in the past appear to be differences in computer hardware, deficiencies in the early systems developed and unwillingness of potential users to adapt their systems.

Appendix 1

COMPUTER-BASED MANAGEMENT INFORMATION SYSTEMS IN USE OR BEING DEVELOPED

Adelaide

(a) Student record system using file of names, courses, subjects, statistical information - on-line file enquiry (but not on-line update) is being developed for use in near future.

(b) Space inventory system is being developed.

(c) Preliminary planning of a personnel system, involving established and filled posts, has begun.

(d) Graduates system - basically name and address - used for electoral purposes.

(e) Consolidated student academic record system - for current and past students - with details of academic record for up to nine years.

(f) Finance system being developed for salaries (1976) and other expenditure (1977).

Monash

Apart from numerous operational reports which it is not considered provide management information as such (e.g. payroll, accounts payable and examination results) the following reports are produced specifically from files of operational systems to assist various levels of management in decision-making:

1. Student enrolments in relation to the filling of faculty/subject quotas.
2. General ledger budget/income/commitment/expenditure reporting by cost centre.
3. Salary budget report and cost analysis, and
4. Establishment control report relating approved positions to occupancy by cost centre.

Following a pilot study involving the equipment register for the University utilising the Data Base Management System for the Burroughs B6700 (DMS II) the University will be investigating the feasibility of developing modules for future systems via DMS in lieu of more conventional COBOL systems utilising mixed disk/tape files. No on-line enquiry or updating is currently being used with any operational system. No use is made of management science or operational research techniques.

Queensland

(a) QUBAC - Queensland University Budget Accounting and Control System - became operational in January 1974. The system has been designed to enable the files to be interrogated twice per day from which an up-to-date picture as to the state of an account(s) can be obtained. No use is made of any generalised data management software packages.

(b) Salaries system - the first stage is expected to become operational in January 1976. The following management reports will be produced:

(i) overtime report: actual v. budget;
(ii) details of vacancies, acceptances and current staff levels;
(iii) staff statistics for U.C.

The software has been written in basic combined programming language, a high level recursive language, while the file design is a hash-addressed, bucket structured file. The file design is not only capable of batch oriented sequential processing but also facilitates efficient interactive processing which is a basic requirement of the system. No use is made of any generalised data management software packages.

(c) The existing program preparing labels for graduates and electoral rolls is being refined to allow easier selection of specified groups.

Sydney

With the assistance of management consultants, a new student record system and accounts system are being developed.

The student record system will cater for enrolments, examinations, update as well as file inquiry facilities.

The new accounts system is in an early stage of development and has not yet been defined. On-line inquiry facilities are planned.

Melbourne

Student record information system; introduced in 1974 with an extensive and computerised data base. This common data base is/will be accessed to provide data and information for a number of sub-systems (student records, enrolment statistics, examination statistics (nearly operational), graduate roll (being developed)). The student records sub-system has on-line enquiry and updating facilities.

Financial Information System: work has commenced during 1975 on a project to convert and extend the financial records to a computer base, to produce more comprehensive and timely reports. The first stage of this has been the salaries payment restructuring project which incorporates the potential to expand the data base to meet the requirements of users.

There is a budget projection system and a number of other systems but as they are for specific purposes such as space inventory, equipment inventory, investments, gifts and grants, etc. they are not really management information systems.

La Trobe

(a) Three specific areas are currently being developed. One - student information - is somewhat more advanced; one other relates to staff information which includes the standard components of salaries and records and the third will provide a system relating to general ledger-keeping and purchasing. These provide useful, timely planning data. The further development of the student information system has languished this year because it has been necessary to dedicate the limited resources of the central ADP unit to the development of the other areas. On-line enquiry and updating is available in the student information system.

(b) C.P.M. is available for certain aspects of the building programs. It may be applied to other administrative functions (e.g. graduation functions) in the future.

(c) There is no data management software in use at the moment.

Griffith

(a) Salaries - staff system being developed in conjunction with University of Queensland on the PDP10 computer. This system will provide the necessary outputs to pay university staff as well as details of all positions (filled or vacant). From the data base, it will be possible to prepare annual and revised quarterly salary budgets as well as project a triennial salaries budget given certain assumptions. In addition to budget projection, the system will provide the necessary reports for detailed budget control. Input will be a combination of punched cards for batch and through remote terminal for topping up information.

(b) Joint Admissions System (QTAC) in conjunction with University of Queensland on PDP10 computer. This system will facilitate the processing of applications for enrolment in both the University of Queensland and Griffith University. The data base built up over time will provide a useful planning aid for future admission policy.

James Cook

The Academic Services Division holds the current enrolment details of all undergraduate students on computer file. From this file the UC statistics, class list and other reports are produced and examination results are added to produce continuing academic records and other reports. The system will be used and developed more fully when on-line access is provided by a terminal located within the Division.

Newcastle

Comprehensive student record system covering all stages from admission, examination to graduation and membership of Convocation will produce reports on various analyses required to provide statistical base for academic and management decision making.

New England

The University has implemented the first phase in what will eventually provide management with necessary and timely data. This stage integrates information from the payroll, accounts payable, ledgers and detail cost reports for department managers. Provision has been made for assistance in the preparation of annual accounts, U.C. financial statistics, inventory registers, bank reconciliations, expediting of orders; although these features will be implemented in later phases of development.

Western Australia

At this stage the computer is involved mainly in meeting operational requirements. The following computer based systems have been developed:

(a) Student records system - contains data on personal particulars, entrance qualifications, current enrolment, previous enrolment, examination results and fees;

(b) Quotas system - contains data on personal particulars, entrance qualifications, and course preferences for all tertiary institutions;

(c) Staff/Salaries system - contains data on staff records, establishment details, deductions, allowances, etc. (Salaries not yet implemented.);

(d) General ledger system - contains data on all accounting transactions;

(e) Space inventory system - contains data on rooms in university buildings, current function of rooms, U.C. classification, dimensions and special facilities;

(f) Library loans system - contains data on all university staff and students, current addresses, current eligibility for borrowing and loan transactions;

(g) Small systems for the meter reading of PABX telephone units and cheque reconciliations.

The data files for the above systems are used to produce extensive operational reports, e.g. the student record system is used to provide confirmation of enrolment advices, summaries of enrolments, weekly lists of changes in enrolment, all kinds of student lists, clash sheets for examination timetables, examination registers, examination result advices, academic records, etc. As the operational requirements stabilise the computer applications will be directed more to the production of some of the reports referred to in Section (a) and also to the production of other reports that cannot be produced using existing methods.

Most systems are based on permanently held disk files, indexed sequentially organised with multiple means of access, e.g. the Student Records Master File is accessed by student serial number, or by faculty/course year combinations, or by units, etc. These files are updated in batch mode on demand according to volume and control requirements, mostly daily. They are available and used for

on-line enquiry by several visual display units. The systems which have been developed to date do not make use of any generalised data management software package or of management science or operational research techniques.

Murdoch

Files have been established and are being maintained on computer which hold comprehensive student, financial and personnel data. An increasing number of management reports will be developed as time passes. However, the priority for program development is currently placed with those areas which take pressure off manual procedures. This situation will continue for approximately two years.

Tasmania

The student file is the base for the allocation of tutorial and practical classes, WSU calculations for staffing formula and part-time assistance appropriation, Union fee notices, examinations time-table.

Flinders

Student information base from enrolment to historical record. Staff records, payroll, budget system.

Wollongong

The University has developed a staff file, a student admissions system and has almost completed phase 1 of a Student Record System, i.e. enrolments, class lists, electoral rolls, confirmation of enrolment and U.C. Statistics.

Macquarie

A student information system has been developed to provide most operational reports needed in the Student Centre such as complete academic records, course and other lists, student fees, examination

check list, result sheets, table number allocation and result notification, including the consequences of the results such as qualified for a degree or failure to maintain progress. In addition comprehensive flow and static statistics are produced including overall student performance and progress, which are available when Senate is considering examination results.

Development of a staff and establishment information system is now well under way with effort now being directed towards pay roll. A number of listings are already produced including the internal telephone directory.

An automated circulation system has been in operation in the Library since 1968, printing overdue notices as well as providing statistics on borrowings. The special reserve system produces lists of items on reading lists and related statistics. A pilot project to produce a machine-readable catalogue has been almost completed and it is likely that further developments will take place in this area.

The finance system has yet to be computerised though accounts payable are now processed. Basic data has now been incorporated into the space inventory system to permit reports required by the Universities Commission to be produced.

All systems are operating in batch mode, though it is planned to introduce limited on-line enquiry and update at least for the Student Information System in 1976. Preliminary investigation only of the UNIVAC D.M.S. 1100 has been made.

New South Wales

(a) The University is planning, as a long range project, the complete transfer of accounting procedures and financial records to EDP with a view to eventual on-line application.

(b) The handling of stores requisitions for items from the Central Store and the receipt of items into the store is dealt with by computer and the Purchasing Section is on-line to the administative computer. Data on the costing of stores items to assist schools as well as the Purchasing Section is produced as required.

(c) A computer program is being developed for implementation later in 1975 in the Faculty of Biological Sciences, as a sub-set of (b), aimed at better stores control in schools.

(d) A computer program for the allocation of classroom accommodation has been developed to facilitate better use of accommodation. While this is principally an administrative tool, it will have its use for planning purposes as well.

A.N.U.

Establishment log system operational except for estimate information contents (Stage 3). It will form part of a personnel management information system.

Student Records System (Undergraduates).

Accounting and Budgetary control system.

All systems are currently operated in batch mode. It is planned to provide on-line enquiry and update facilities for most systems within 1 or 2 years. TOTAL, a data base management software package, is currently being evaluated and it is envisaged that it, or a similar package, will be used for future and revised systems development. Circulation and Cataloguing systems being developed in the Library will produce management information as a by-product.

Appendix 2

SIMULATION MODELS USED IN PLANNING

Adelaide

A model for predicting student numbers using simulation on a digital computer has been completed for use in estimating effects of changes in quotas, changes in pass rates, etc. Has also been applied to determine the intake needed to meet a specific demand for graduates in a particular course.

A simulation of study leave applications to provide estimates of the cost of a proposed new study leave scheme was developed and used by management.

Monash

Three mathematical models have been developed to assist with the annual budget preparation, viz. Academic Staff model, general support staff model, maintenance fund model. These are all non-computer based utilising electronic calculators to obtain results.

Melbourne

An academic staffing model (1972) and non-academic staffing model (1973) were developed to aid the Central Budgets Committee in its determination of resource requirements for teaching and research. The workings were done manually. During late 1974 and 1975 a financial allocations model has been developed which supersedes the earlier models. This is a computerised model. Student projections are manually manipulated by Statistical Officer.

Flinders

Currently under development EFTS/WSU/student number projection.

Macquarie

'Student-driven' computer-based model to project student enrolments, graduates, EFTS by School and field of study, course enrolments, academic and non-academic staff and teaching space needs. Inputs are planned student intakes, the courses to be offered, teaching methods, present inventories of students, staff and teaching space. Assumptions are made as to the inter-relationship between the student enrolments and resources of staff and space required. Assumptions about student progression rates, distribution of student load and other student information are based on reports about actual rates produced from the Student Information System and projected trends. Further development is contemplated in regard to projecting other space needs as well as of the likely recurrent and capital expenditure required.

Appendix 3

ACADEMIC AND FINANCIAL ORGANISATION AND REPORTING STRUCTURE

Adelaide

Council has three major committees - Education, Finance, Planning. All academic proposals go to Council through the Education Committee, along with comments of the Finance Committee on their financial implications. The Finance Committee is responsible for the preparation of the annual budgets on the basis of which available funds, after standing commitments have been met, are placed at the disposal of an Allocations Committee which divides them among the various academic and other development programs in response to submissions received from the relevant committees (which, if they deal with academic matters, also report to the Education Committee).

Monash

Monash is a decentralised university and the financial organisation is divided primarily into major budgetary divisions (e.g. a faculty). Within each such division the financial organisation is delegated to a lower budgetary unit (e.g. a teaching department). The Professorial Board is the senior academic committee. Each faculty has a faculty board which reports to the Professorial Board. In addition the Committee of Deans and various standing and ad hoc committees report to the Professorial Board. The Council has committees for finance, buildings, staff, halls of residence, housing and transport and Students' Loan Fund.

Administratively the Vice-Chancellor is assisted by two pro-Vice-Chancellors. Reporting to the Vice-Chancellor are the Academic Registrar, the Comptroller, the Librarian, the Director of the Computer Centre and the Dean of the Faculties.

Queensland

The Professorial Board is the senior academic committee. Each faculty has a faculty board which reports to the Professorial Board. The Board has a "staffing committee". The Senate has a Buildings and Grounds Committee and a Finance Committee which has an Equipment and Maintenance Committee. Administration - the Vice-Chancellor is assisted by two deputy Vice-Chancellors (Academic and Fabric and Finance). Reporting to the Registrar are the Deputy Registrar (covering staff, academic and research), the Bursar and Planning and Statistics.

Sydney

The Vice-Chancellor and Principal is assisted by two Deputy Vice-Chancellors (Buildings, Research, Equipment and Academic), a Deputy Principal (Accounting, Property, Services, Non-Academic Staff) and a Registrar (Academic Staffing, Data Processing, Academic). The Senate has a Buildings and Grounds Committee, a Finance Committee and an Advisory Committee on Appointment to Chairs. The Academic Board is the senior academic body - with Faculties and Boards of Studies reporting to it.

Melbourne

The general academic administration is conducted by Faculties and Boards of Studies and supervised by the Professorial Board. There are a number of joint committees of the Professorial Board and Council including Library, central budgets, research and graduate studies, buildings planning, continuing education. Included in the committees of Council are Finance, Buildings, Staff.

La Trobe

There are three committees responsible in the main for advising Council

(a) Academic Board - responsible for advising on academic matters; this advice may be received from Boards of Studies of Schools.

(b) Finance Committee- responsible for overview of the operation of the university's financial processes including recommendations to Council on all financial policy.

(c) Buildings Committee - similar function to Finance Committee in respect of the University's building program.

The administrative organisation is made up of two departments whose heads report to the Vice-Chancellor - Registrar, Business Manager. The Registrar's Office covers secretarial, academic services, staff and information services, legal office, student affairs and university advisory services. The office of the Business Manager covers Admin ADP (jointly with Registrar), services, finance, purchasing, student and staff housing, buildings and maintenance.

Griffith

Council is the main governing body of the University. The School is the basic academic unit with recommendations on academic matters flowing from Schools through Academic Committee to Council. Within the School, the Executive Officer is the School Chairman who is supported administratively by the School Administrator. Finance Committee is the standing committee of Council through which recommendations on financial matters flow. Within a policy framework approved by Finance Committee and Council and subject to a number of checks and balances (e.g. the role of the Business Manager) individual Divisions of the University have a marked degree of autonomy. Monthly financial reports to Finance Committee and Council flow through the Business Manager. With respect to the operating division of the University - Schools and the general divisions, the role of the Business Manager is information giving and audit rather than permission giving.

James Cook

Faculties report to the Academic Board, which has Research, Library, Computer Centre, Standing and Matriculation Policy and

Admissions Committees. The University Planning and Development Committee reports to Council.

Reporting to the Vice-Chancellor are the Registrar (academic, administrative and personnel services), the Bursar (financial services) and the Controller (Buildings and Grounds).

Newcastle

Academic structure - Council - Senate - Faculty Boards - Departments. There are also some Boards of Studies related to specific areas of studies. Except for Board of Environmental Studies which reports to Senate, these act as committees of Faculty Boards.

Financial structure - Council - Finance & Personnel Committee - Vice-Chancellor - Departments (Vice-Chancellor advised by Committee - Vice-Principal, D.V.C., Deputy Chairman of Senate, Bursar) - on overall budget and by Allocations Committee of Senate - V.C., Deputy Chairman of Senate - on allocations to academic departments.

New England

The Council is the senior body of the University and has the following committees - Appeal, By-Laws, Council/Staff Consultative, Finance, Joint Council/Professorial Board Lands Committee, Planning, Proctorial and Study Leave. The Professorial Board is the senior academic body and has the following committees - Academic Planning, Admissions and Matriculation, External Studies, Ph.D., Professorial, Promotions and Selection. The Vice-Chancellor is a member of all committees and reports to them all while any member of the University is able to approach Council, even though Council may in turn refer such an item to the appropriate committee. Members of the administration report to these committees as well as to the Vice-Chancellor.

Western Australia

The Senate is the governing body of the University and has amongst its committees - Buildings, Digital Computer Policy, Extension, General Purpose, Legislative, Library, Raine Medical Research Foundation, Staffing, University Research, Finance, Investments and Endowments, Travel Grants, University Bookshop, U.W.A. Press and various Postgraduate Education committees.

The Professorial Board is the senior academic body and has amongst its committees - Matriculation & Admissions, Ph.D., Scholarship and the Academic Council which has a Planning and a Staffing Committee. Faculties and Boards of Study also report to the Professorial Board.

The Vice-Chancellor is the chief executive officer. Other executive officers are the Deputy Vice-Chancellor (University Extension, Staffing, student services), the Registrar (secretariat, convocation, information and publications, general services) and the Vice-Principal (Bursar, Architects, Estates, ADP, Planning).

Murdoch

The University is divided into six schools of study, each of which is responsible to Academic Council. Funds are allocated to schools and the school chairman is responsible for the preparation, in accordance with the procedures and policies defined by the Finance Committee, of a school budget for the allocation of these funds. The School Board may advise the Chairman in carrying out this responsibility.

The senior administrative structure of the University is divided into three main areas responsible to the Vice-Chancellor's Office; the Finance Office (including Personnel), the Secretary's Office (including academic services, management systems and information and publications) and the Property Office.

Tasmania

The Council is the governing body of the University and has among its committees Buildings, Finance and Development - the latter being responsible for advising on academic and campus planning and being a joint committee of the Council and the Professorial Board.

The Professorial Board is the senior academic body and has among its committees the Committee of Deans, the Research Committee and the Standing Committee.

The Vice-Chancellor is the chief academic and executive officer and is Chairman of the Professorial Board. There are also a Pro-Vice-Chancellor and a Deputy Chairman of the Professorial Board.

The Registrar's Office has three branches - the Architect's Branch which is responsible for capital works and maintenance, the Bursar's Branch which is responsible for financial management and reporting and the Deputy Registrar's Branch which is responsible for academic services.

Flinders

The Council is the governing body of the University and has amongst its committees - Academic, Finance and Buildings, Board of Discipline, Matriculation Board, Allocations and various staffing committees.

The Academic Committee is the senior academic body and has amongst its committees - Research, Computing, Library Advisory, Higher Degree, Public Relations. Each School has a Board and reports to the Academic Committee.

There are four administrative units responsible to the Vice-Chancellor; Health and Counselling Service, the Registry, Architect's Office and University Relations Unit. The Registry has three divisions - Academic (student administration, statistics), Bursar, Deputy Registrar (staff, services, maintenance).

Wollongong

The Council is the governing body of the University. The supreme academic advisory body is the Academic Senate. Teaching departments are grouped into faculties which report to Senate. The Resources Committee, consisting of the Vice-Chancellor and four persons elected by Senate, advises the Vice-Chancellor on resources for departments. The Budget Advisory Committee, consisting of the Vice-Chancellor, Deputy Vice-Chancellor, one member from Resource Committee, Bursar, Estate Manager and Librarian, advises the Vice-Chancellor on global budget proposals.

The Vice-Chancellor is the chief executive officer.

Macquarie

The Council is the governing body of the University and has amongst its committees - Finance, Buildings and Grounds, Advisers on Legislation.

The Academic Senate is the senior academic body and has amongst its committees - Undergraduate Studies, Postgraduate Studies, Education, Part-Time Studies, Academic Development, Timetable, Teacher Education Program and a number of interdisciplinary committees. Each School meets at least four times each year to consider general academic matters pertaining to the School and to make recommendations to Academic Senate.

The Vice-Chancellor is the chief executive officer and is assisted by two Deputy Vice-Chancellors (Academic and Administrative). The Registrar, Librarian, Director, Part-Time Studies, and Student Counselling and Health Services report through the Deputy Vice-Chancellor (Academic) whilst the Bursar and Architect-Planner report through the Deputy Vice-Chancellor (Administrative). The Head of each School is responsible to the Vice-Chancellor for the academic and administrative functioning of the School, including the application of financial resources made available to the School.

New South Wales

The University is organised in the traditional way with its 50 schools and 10 autonomous departments grouped into 10 faculties. Heads of Schools and Deans are appointed by the University Council - chairmen of faculties are elected.

The business of the University is handled in two broad inter-related streams - one dealing primarily with academic studies and the other with the facilities required to implement the research and educational programs.

Academic course proposals and the like and matters related to students usually proceed via the Registrar through the faculties and Professorial Board to the Vice-Chancellor who, if necessary, forwards them to Council through the latter's Academic Committee.

General administrative matters not concerned directly with academic studies are handled by heads of schools, deans of faculties, the Pro-Vice-Chancellors and the Vice-Chancellor. If necessary recommendations are sent to Council through appropriate sub-committees.

The central administration is divided into three main divisions - Registrar's, Bursar's and Business Manager's (Property), which advise the Vice-Chancellor and the Pro-Vice-Chancellors.

Among other duties the Vice-Chancellor is responsible, under the Council, for the management and the administrative, financial and other activities of the University; under the Vice-Chancellor the Deans are responsible for the administration of their faculties; in consultation with their heads of schools the deans are responsible for the preparation of the financial estimates, the deployment of staffing allocations and funds for materials, equipment, travelling, part-time teaching, etc.

A. . .U.

The Council is the governing body of the University and there is a Board of the Institute of Advanced Studies and a Board of the School of General Studies. Research Schools, Faculty Boards, Faculties and Departments report to the former Board and Faculties report to the latter. The Professorial Board which comprises all University professors rarely meets.

Financial matters come to Council through the Finance Committee. The Vice-Chancellor is the chief executive officer. On financial matters the Bursar, Heads of Schools, Deans and Heads of Sections report to the Vice-Chancellor. The Bursar has an Accountant, Budget Officer and Business Officers assisting Heads of Schools, Deans and Heads of Sections.

Appendix 4

PLANNING MECHANISM

Adelaide

In the past the Planning Committee has had the responsibility for the preparation of the University's triennial submission and the development of a long-term plan. Proposals currently being considered by the University include a new Co-ordinating Committee which will have the responsibility of (a) preparing the UC submission, (b) Planning and Allocation of resources, in accordance with the UC submission; (c) co-ordination of the recommendations of the Ways and Means Committees (money spending committees); and (d) consultation with the Finance Committee in the preparation of the annual budget. The new Planning Committee will be responsible for preparing a long-term plan and consulting with the Co-ordinating Committee on the implementation of short-term plans in terms of the long-term plan.

Monash

For the preparation of the UC submission the development committee considers and prepares the proposals for new developments, university and faculty size and new buildings. Proposals originate from faculty planning committees and all units of the university. After the Professorial Board has adopted the recommendations, the Development Committee meets with the Council Planning Committee, and the submission is recommended to Council. The annual recurrent funds budget is prepared by the Vice-Chancellor and Pro-Vice-Chancellors meeting with the Committee of Deans, during July-October for the following calendar year. Staffing and maintenance formulae are applied as a first indication of the needs of the faculties, whilst submissions are obtained from other major budgetary units (e.g. library, computer centre). The Vice-Chancellor recommends the budget to the Professorial Board and Council.

Queensland

The Vice-Chancellor's Committee on University Planning consists of the Vice-Chancellor, his two deputies, the President of the Professorial Board and the members of its "staffing committee", the Registrar, the Librarian, the President of the Student Union, together with five other senior academic staff from major subject areas. Assisted by its working sub-committees it considers proposals for new developments submitted by departments and sections and advises the Vice-Chancellor on the formulation of the triennial submission and on the allocation of resources made available in response to those submissions. The necessary statistical data and forward projections are provided by the Planning and Statistics section.

Melbourne

Academic - joint committee of Council and the Professorial Board, Faculties/departments.

Students - student numbers sub-committee.

Physical - Buildings Committee, Central Building Planning Committee.

Finance/staff - Central budgets committee, special committee for recurrent submission; faculty budget committees, budget formula allocation sub-committee.

Trusts/investments - Finance Committee, Provident Fund Committee.

La Trobe

Academic Development - is considered in the first instance by the Advisory Committee on Academic Development which reviews submissions from Schools, departments and from time to time 'special-interest' developments from other sources. Such developments include the establishment of new schools, institutes or research centres and any other areas which the Academic Board seeks to be reviewed.

Triennial Submission - is compiled by the Triennial Submission Committee which collates all intra-university proposals relating to growth and development for the forthcoming triennium. Information gathered by the committee includes details of capital expenditure for buildings including student-funded facilities.

Griffith

Planning starts with the School Standing Committee which develops ideas and seeks to have them adopted by Academic Committees. Once objectives have been agreed to, the Standing Committee develops operational plans. On the financial side, the Budget Committee consists of the Vice-Chancellor as Chairman and all Divisional Executive Officers. There is quite a degree of inter-relationship between the outputs of the School Standing Committee and the Budget Committee which seeks to develop a budget consistent with the operational plans of the School Standing Committees.

James Cook

University Planning and Development Committee - Chancellor, Deputy Chancellor, Vice-Chancellor, Registrar, Chairmen Finance Committee, Buildings and Grounds Committee, Academic Board. President: Staff Association. Two members of Council, one member of Academic Board, one Union member of Council.

Resource allocation - academic staff and non-academic staff related to academic departments - Vice-Chancellor on advice of Standing Committee. Other non-academic staff - Vice-Chancellor on advice of Registrar. Finance - Vice-Chancellor on advice of Standing Committee.

U.C. submissions - predictions of student numbers and resources are subjective judgments by Council and Academic Board based on manual trend analysis.

Newcastle

Planning Committee of Senate considers all proposals for developments. This committee was previously chaired by the Deputy Vice-Chancellor with responsibility for preparing the University's triennial submission but is now chaired by the Vice-Chancellor.

New England

Planning is carried out in a variety of ways depending on the nature of operation. Usually senior members of the academic and administrative staff together form the planning group and, depending on the nature of the project, report to the Council or the Professorial Board and where necessary take the appropriate executive action. Senior staff are responsible for particular areas of administration and are consulted and usually included in the final decision-making body.

Western Australia

The means of allocating resources varies according to the category of resource. Academic and non-academic staff positions are mainly allocated on the basis of detailed recommendations made by the Staffing Committee of the Academic Council. Accommodation is allocated by the Vice-Chancellor.

For the 1976-78 triennial submission a Working Party was set up. Projections of student and staff numbers were prepared by the Planning Office. Technical data and cost estimates for the capital works program were provided by the Architect's Office, estimates of expenditure other than on capital works by the Bursar's Office and material on libraries by the Librarian.

Murdoch

Planning is co-ordinated through the Vice-Chancellor's Office. The University does not have a formal Planning Committee although there is an advisory committee to the Vice-Chancellor concerned

with resource allocation that has assumed some responsibilities in regard to planning. This advisory committee is serviced by staff of the Vice-Chancellor's Office. The same staff are responsible for the co-ordination of the preparation of the triennial submissions to the Universities Commission.

Flinders

There is a long range planning group. Student number forecasts are used as a base to determine staffing forecasts, general finance, budgetting and building forecasts. Some consideration is presently being given to the use of a generalised growth forecasting package for computer.

Tasmania

The University Development Committee with its two sub-committees, Campus Development Committee and the Academic Development Committee, is the body responsible for planning in the first instance.

Wollongong

The Vice-Chancellor establishes various committees to advise him on the preparation of the triennial submissions to the Universities Commission. The Estates Manager advises the Vice-Chancellor on matters related to physical planning.

Macquarie

Academic developments originating from Schools are considered by the Academic Development Committee of Academic Senate, which consists of the Vice-Chancellor, the two Deputy Vice-Chancellors, the Vice-Chairman of Academic Senate and five members appointed by Academic Senate.

The Committee to Advise the Vice Chancellor, which consists of the Heads of each School and the two Deputy Vice-Chancellors, considers academic staffing establishment and the allocation of

funds to Schools for equipment and maintenance. An establishment and promotions committee considers non-academic staffing establishment.

For the 1976-78 triennial submission the Vice-Chancellor set up a working party. Projections of student, staff and teaching space requirements were prepared by the Statistics Office. Financial implications were prepared by the Bursar's Office and building implications by the Architect-Planner's Office.

New South Wales

As with other Australian universities, the University is required to submit triennial estimates to the Universities Commission with supporting data on the expected growth and development which give rise to the sums sought. Heads of Schools are involved in the detailed estimates of student numbers, staffing, accommodation, equipment, departmental maintenance and research requirements. These submissions are subject to consideration by the deans, Pro-Vice-Chancellors and the Vice-Chancellor prior to submission to the Commission.

The Vice-Chancellor has appointed a body known as the Vice-Chancellor's Advisory Committee to advise him at weekly meetings on such matters as the allocation of finances, purchase of equipment, staffing and establishment and in any general matters affecting the University. The committee comprises the Pro-Vice-Chancellors, the deans, heads of administrative divisions and the Director at Broken Hill. After consideration of the overall budgetary allocations for recurrent purposes by the VCAC, a sum is made available to the dean of each faculty who, after consultation with heads of schools, allocates the money to the various schools of the faculty, the heads of which are then responsible for the management of their allocation thereafter.

Staffing requirements are considered by the VCAC separately and an allocation of notional dollars is made to the deans each year

for the purpose of funding the costs associated with additional positions.

The annual allocations for library purposes are made by the Library Committee of the Professorial Board in consultation with the Deans within the sum allocated from the University budget for Library expenditure.

When the University is aware of the capital program approved, it establishes a planning committee for each project, usually comprised of the appropriate dean, the head of school and officers of the Property Division. All requirements are collated by the committee to form the basis of a brief to the architects.

Planning of developments in the computer area is in the hands of a Pro-Vice-Chancellor who is assisted by the Computing Science Committee of the Professorial Board and a Computer Services Advisory Committee.

A.N.U.

Each year the Vice-Chancellor presents the budget to Council. The Vice-Chancellor's Advisory Group determines broad parameters and sets three guideline figures, one for each of the major cost Centres (Institute of Advanced Studies, School of General Studies, Central Areas). In the Institute the Heads of Research Schools decide on school allocations and school faculty boards decide on departmental allocations. In the School of General Studies, Deans decide on faculty allocations and faculties decide on departmental allocations. In the Central areas the senior officers and the Librarian decide on allocations with the central areas and Heads of departments/sections decide on department/section allocations.

The preparation of the triennial submission can involve all staff at all levels in initiation, formulation and assessment of proposals either individually or in working party or committee stages. Proposals are considered by all academic bodies before

submission to Finance Committee, Council's Education Committee and a special committee appointed by Council for this purpose. Simultaneously, financial implications are discussed by the Bursar and Business Officers.

Sydney

Building - Senate's Buildings and Grounds Committee.

Staff - proposed increases are in the first instance considered by the Vice-Chancellor's Establishment Review Committee. The recommendations of the Committee go to the Senate's Finance Committee.

Library - recommendations on planning and developments in the Library area are in the hands of a Library Committee which contains members of the Library, academic and administrative staff.

Finance including Investments - Finance Committee of the Senate.

STUDENT INFORMATION - Student Enrolments

Appendix 5.

Data available at depart.	Produced by		Used by	Use made of report	Frequency of production (per year)	Method of data collection
	Univ.	Section				
Analysis of offers and enrolments from selection process	Adelaide	Admissions Office for Higher Educ.	Ac. Registrar, all faculties	Admissions Policies & Planning	4-5 during admissions & final	M/C
Course/subject enrolments for current year and comparison with previous year(s)	Adelaide	Admin.Comput. Services Unit	Admin, faculties & departments	staffing, accom., future predictions	1	M/C
Withdrawals, amendments to enrolments	Adelaide	Acad.Registrar	Acad.Registrar	Planning	1	M
Enrolments by faculty/year and quotas	Monash	Acad.Registrar	Council, Deans, Prof. Board	review enrolment figures	3	C/M
Various operational lists & statistics (incl.enrolment projections, subject enrolments, student load by dept.)	Q'ld	Statistics and Data Processing	Reg/Asst.Reg.	Planning/resource allocation	4	C
Admission statistics - analysis of offers and acceptances	Q'ld	Data Processing	Reg. & Deans	officers	4	C
Analysis of exclusions following failure	Q'ld	Enrolments	Registrar	Admissions policy	1	M
Dept. enrolments by undergraduate years, O.T.H.D. by type of degree, H.D. by type of degree. Dissection of Dept. enrolments by Faculty of registration & degree enrolments by sex	Sydney	Stats Office	Sen.Admin.staff Deans, Heads of Depts, Profs	resource alloc. analysis of enrolments, trends both past & future	1	M/C
Analysis of students by term and permanent home address	Sydney	Stats Office	Stats Office	Analysis of location of students	1	C
Course year w/i course, w/i level x attendance x sex	Melb.	Stats Office	Deans, Fac. Secs.	Monitor enrolments	20	C
Progressive enrolments to date compared with previous week, last year actual and current year estimate	Melb.	Stats Office	Admin.Com.	Monitor enrolments	20	M
Effective enrolment registrations x school x H.D., O.T.H.D.	La Trobe	Student Centre, ADP Unit	Deans, Dept. C'mon, selection com.	assessing progress of offers of places & re-enrolment	daily Jan-Mar, other times as determined	C
Subject enrolments	La Trobe	Student Centre, ADP Unit	Dept. C'mon, course co-ords., Student Centre	overview of quotas allocation of facilities, revision of t'tables	weekly Jan-Mar, other times as determined	C
Subject combinations - details of enrolments for particular subject combined with other subjects.	La Trobe	Student Centre, ADP Unit	course co-ord, Student Centre	allocation of tuts revision of t'tbls	as required	C
Analysis of selection quotas and offers	La Trobe	Schools Exec.Off'cr Officer	Selection com's, all schools	determine number offers to be made	1	M
Enrolments by course, course load, sex, year, level, school, dept., new & contin., age, residence, etc.	La Trobe	Stats Officer	Admin, Heads of Departments	information and planning	1	M
Academic progress report	La Trobe	Schools Exec Offcr	Registrar	inf.re show cause	1	M
Analysis of enrolments from secondary schools	Griffith	Student Affairs Officer	School Exec. Officers & Admin.	determine recruitment pattern & school visits	1	M
Enrolments by course, year and year of course	J.Cook	Inform.Res.Off.	Acad.Serv.Div. Heads of Depts	planning	12	M/C
Projected student enrolments	J.Cook	S.A.O.(Ac.Serv)	Standing Com,V-C	acad.staff estab.	1	M
Selection & admission statistics	N'cle	Sec's Div.	Admissions Com.	determine offers	1	C
Student & subject enrolment	N'cle	Sec's Div.	Heads of Depts Gen.& Alloc.Com.	inform on class	20	C
New enrolments - offers & acceptances, faculty & course details, previous quals, etc.e.	U.N.E.	Enrolment Officer	Council, Prof.Bd, Adm & Matric.Com.	plan future intake & predict growth areas & demand	1	M
All enrolments - details of courses, etc.	U.N.E.	Stats. Officer	Council, Prof Bd, Facs, Depts.	predict trends in order to plan future enrolments	1	M/C
Details of all withdrawals from U/G courses incl. reasons	U.N.E.	Educ. Res.Group	Admis.& Matr.Com, Prof Bd, Council	plan future intake & possible changes w/i acad/non-acad areas	1	M/C
Class lists showing personal data, entrance quals, current enrolment	W.A.	Stats. Section	Heads of Depts.	basis for organ. tuts tuts & u/t teaching	2	C
Student enrolment projections, total, load, and enrolments in 1st year undergraduate courses	W.A.	Stats. Section	Planning Com.	determine quotas	1	M
Enrolment projections in each unit or HD course available in each dept.	W.A.	Stats. Section	Heads of Dept. Univ. bookshop	basis ordering textbooks	1	M
Class lists and numbers	Tasmania	Student Admin. & Stats.	Admin & Depts	adjustments to teaching times	3	C
Laboratory and tutorial lists	Tasmania	Student Admin. & Stats.	Admin. & Depts	allocn to variable time.	2	C
Enrolment, address and finance lists	Flinders	Stats. section	Admin & Depts	General admin.	6	C
Total enrolment & EFTS by course and subject	Woll.	Stats. Officer	VC,Reg,Resource Com.	monitor enrolment levels	daily during enrolment	C
Students enrolled in each course	Macq.	Student Centre	Schools	record assessment	6 with weekly updates	C
Academic records containing personal info, entry qual., results for prev. years & current enrolment	Macq.	Student Centre	Schools, Part-Time Studies	student advising	4 with weekly updates	C

STUDENT INFORMATION - Student Enrolments (continued)

Main contents of Report	Produced by: Univ.	Produced by: Section	Used By	Use made of report	Frequency of production (per year)	Method of production
Projected student enrolments and estimated numbers in courses	Macq.	Stats. Office	Schools, bookshop t'tabling & accrn UGSC, Senate	planning, ordering textbooks	2(min.)	C
Level of courses taken by w/d'd yr & type of attendance	Macq.	Stats Office	Schools, Stats. Office	future predictions	2	C
Weekly enrolment reports up to end March	N.S.W.	Stats.	V.C.A.C.	late offers	7	M/C
Various student statistics, e.g. Stats. Bulletin	N.S.W.	Stats.	Registrar	publication	1	M/C
Enrolments by courses by year/stage	N.S.W.	Stats.	Deans	planning	1	C
Projected student enrolments, planned 1st years & year/subject enrolments	N.S.W.	Stats.	V.C.A.C.	planning	1	M
Various student statistics	A.N.U.	Stats. Officer	Various	general planning	1 or more	C
Class lists and totals	A.N.U.	Management Services Group	Student Admin.	resource allocation	8	C
Faculty report	A.N.U.	Management Services Group	Student Admin.	resource allocation	8	C
Analysis of offers and enrolment during selection process	Murdoch	Acad. Admin.	Admiss. Comm.	determine offers of places	1-2	C
Enrolments x program & course	Murdoch	Acad. Admin.	VC's Off., Course organisers, Admiss. Comm.	projecting future enrolments, planning / resource allocation	2+	C
Projections of student enrolments	Murdoch	Stats. Officer	Resource Alloc. Comm.	planning	1	M

STUDENT INFORMATION - Student Load

Main contents of Report	Produced by: Univ.	Produced by: Section	Used By	Use made of report	Frequency of production (per year)	Method of production
Load classified by type of course	Adel.	Admin.Comput. Services Unit	Stats Officer	Planning course loads	as required	C
Prediction of teaching load per department using course enrolment prediction	Adel.	" "	" "	Predictions for planning	as required	M
Load by subject and department	Monash	Acad. Reg.	Deans/Depts.,	Budget alloc.	6	C/M
Load by department (by subject and level of subject)	Q'ld	Stats & Data Proc.	"staff" com.	changing estab.	4	C
Load by department with faculty & univ. summaries dissected by type of degree	Sydney	Stats Office	sen.admin.staff, Deans, Heads of Depts, Professors	resource alloc. analysis of enrolment trends both present & future	1	M/C
Load by dept. w/t faculty & other breakdowns	Melb.	Stats Office	Facs, Depts.	monitor enrolments	20	C
Load by year level w/t faculty/dept 30 Apr & 31 Dec.	Melb.	Stats Office	Deans, Stud.No.Com.	Determine wastage	1	M
Load x OTHD, HD, TOTAL x Faculty/dept, Actual vs Estimate	Melb.	Stats Office	Student No. Com., Budget Com.	aid in determination of resource alloc.	1	M
Projected load: OTHD, HD, Total x Faculty	Melb.	Stats Office	Student No. Com., Budget Com., Facs.	basis of planning	1	M
Load x course, school & depts.	La Trobe	Stats Officer	Heads of Depts	budget procedures	1	M/C
Load x year	J. Cook	Inform.Res.Off.	V-C, Standing Com.	acad.staff estab.	1	M/C
Load & course weightings for all subjects & courses x dept.	U.N.E.	Stats. Officer	Depts, Acad.Plan. Com, Budget, Advice Com.	basis for future staffing & finance & for dept.planning	1	M/C
Current year and projected load x dept.	W.A.	Stats. Section	Staffing Com.	guide for alloc. new staff & study leave replacement	1	M
Student load tables by department with summaries	A.N.U.	Stats. Officer	Standing Comms., Heads of Depts.	staffing	5-10	C
Load - counts by unit of attending, exempt, partially exempt, hons, postgraduate	Tasmania	Student Admin. & Stats.	Admin sections, Prof. Board	Funds allocations, statistics	1	C/M
WSU staffing formula - units, enrolments, weights, teaching hours, formula value	Tasmania	Student Admin. & Stats.	Admin sections, Prof. Board	assist with staff & budget alloc.	2	M/C
Class numbers and WSUs, summarised by degree/level, discipline, school and university	Flinders	Stats. Section	Stats. Section	basis for projection	2	C
Projected loam in WSU and by degree	Flinders	Stats section	Alloc. Com.	growth management	2	M/C
Distr. of load x school & field of study x level & class	Macq.	Stats Office	Schools, DVC	review acad.staffing	6	C
Projected load x school & field of study	Macq.	Stats Office	Schools, Com.to Advise VC	guide to determ. acad. staffing	2	C
Student load by school	N.S.W.	Stats.	V.C.A.C.	faculty mix	2	M/C
Student load by subject, by course	N.S.W.	Stats.	Deans	planning	1	C
Next year's projected student load by school	N.S.W.	Stats.	V.C.A.C.	planning	1	M

STUDENT INFORMATION - Average Class Sizes

Main contents of Report	Produced by: Univ.	Produced by: Section	Used by	For main of Report	Frequency of Production (per year)	Method of Production
Head count list for each subject (Part of student load printout)	Q'ld	Data Processing	Stats Officers, Depts., "staff" com.	changing establt.	4	C
Lecture hours for class of given sizes in dept.	Q'ld	Planning Officer	"staff" com.	changing establt.	1	"
Average no. of enrolments in each subject x yr. level x dept. and distribution of subject size x size x dept.	Melb.	Stats Office	to be incorporated into a Dept. Fact Book being developed		1	"
Enrolments by each subject	La Trobe	Student Affairs	Heads of Depts	information & planning	regularly	C
Actual class size for current year & projected class sizes	Flinders	Stats. section	School/Dept.	Lab.size planning	1	"
Average class size for tuts & labs x school & field of study, actual and projected	Macq.	Stats. Office	Schools, Com. to advise VC	guide to determine acad. staffing	1	C

STUDENT INFORMATION - Entry Qualification

Main contents of Report	Produced by: Univ.	Produced by: Section	Used by	For main	Frequency of Production (per year)	Method of Production
Frequency distribution of 1st year enrolments analysed by course	Adelaide	Admissions Office for Higher Educn	Academic Reg., faculties	Admissions Policies	1	C
Matriculation scores required for entry	Adelaide	Admissions Office for Higher Educn	Academic Reg., faculties	Admissions Policies	1	M/C
Level of entry	Monash	Acad. Reg.	Faculties	annual differences of 3 groupings	1	C
Highest qualification of new students	Qld	Statistics	Registrar	setting quotas and publication	1	C
Analysis of new students in conjunction with MUAC. Shows mode of qualifications, preferences, HSC aggregate distn., faculty aggregate cut-offs, numbers admitted to each course	Sydney	Registrar's Office	Senate & academic board & Senior Admin. staff	analysis of new entrants & basis for future quotas	1	C
Analysis of performance by applicants with certain entry qualifications	La Trobe	Student Affairs	Board of Studies, School Com.	planning & implementation	1	C
New students by entry qualification type	La Trobe	Student Affairs	Admin., Heads of Depts	planning and information	1	C
Qualifications of all new undergraduate students	U.N.E.	enrolments	Admission & Matric.Com., Prof. Board	check enrolment trends & plan future intake requirements	1	M/C
1st Pref. applns from new students by course & category of entrance qualification	W.A.	Admissions Office	Matric.& Admis. Com.	guide to determine restrictions on part.cats of ents quals & no. of offers to be made	1	C/M
1st Pref. applns from new o'seas students x course & cat. of entrance qualification	W.A.	Admissions Office	Matric.& Admis. Com.	guide to determine early offers to o'seas students	1	C/M
Scaled teacher est. of subject marks, exam aggregs, est.agg. & mean of scaled teacher est. & exam. agg.	W.A.	Research Unit in Univ. Educn	Matric. & Admis. Com.	basis for selecting some cands who performed poorly in leaving exam	1	C/M
Age distn., home and term location and highest entry qual.	Murdoch	Acad. Admin.	Admiss. Off. Stats. Off.	info. & projecting new student nos.	1	C
New students with entry quals obtained outside State	Tasmania	Clerk of Exams	Exams, Admiss, Prof. Board	granting matric.	1	C/M
New students by entry qualification	Flinders	Stats Section	Acad. section	analysis of new students	1	C
Frequency distribution of matric. aggregates for new u/grads by school	Macq.	Stats Office	Schools, Senate	guide to ability level	1	C
Secondary schools from which new students came	Macq.	Stats Office	Student Centre	mainly information	1	C
Quality indication of students enrolled in each course (HSC aggr. distn used for 1st yr courses, G.P.A. distn for later year courses)	Macq.	Stats Office	Heads of Schools	guide in considering distn of results	1	C
Students dissected by High School and HSC performance	A.N.U.	Stats Officer	Faculties, Admissions Off	admissions planning	1	C
Preparation of Tas. Matric. list from annual HSC and list of prizes and scholarship winners	Tasmania	Student Admin. & Stats.	Prof. Bd , Exams, Enrol., Press, CAE	admission to universities, Public report	1	C/M
Statistics of HSC and matric performance by year & school	Tasmania	Student Admin & Stats	Prof. Bd., Enrol, OC	forecasts of enrolment trends	1	C/M
Analysis of admissions by post code, course pref., HSC aggreg.	Wolt.	Student Serv.	U/Grad. Studies Com., Registrar	admissions policy	as required during admissions period	C

STUDENT INFORMATION - Examination Performance

Main contents of report	Produced by		Used by	Use made of report	Frequency of production (per year)	Method of production
	Univ.	Section				
Pass/Fail rates for subjects showing separate figures for full-time & part-time students with summaries by faculty and year of course	Adelaide	Acad.Registrar, Admin.Comput. Services Unit	Faculties	assessment policy	as required	M/C
Exam results by faculty and year	Monash	Acad. Reg.	Prof. Bd & C'cil	review performance	1	M/C
Numbers sitting for course and distribution of students by pass/fail at annual and deferred exams	Sydney	Stats. Office Admin. D.P.	Deans, Profs., Heads of Depts.	analysis of trends in pass rates	1	C
Exam stats showing subject results by total enrolled candidates, total passed & pass grades obtained, % pass rates (& in 1975 pass rates x school, F/T & P/T students)	La Trobe	Stats. Officer	Heads of Depts	information on pass rates, performance of students	1	C
Chairmen of examiners summaries	La Trobe	Exec. Asst., Student Affairs	Chairmen of examiners, Bds of Studies	determine awards & academic progress		-
Pass/failure rates in each subject/course	U.N.S.	Exams Officer	Depts.	course planning	3	M/C
Unit pass rates - drop outs between 30 Apr. & annual exams, pass rates, grades of pass, pass rates for earlier years	W.A.	Stats. Section	Heads of Depts	comparative analysis	1	C/M
Exam result summary	Murdoch	Acad. Admin.	Boards of Study Course organisers	review students' progress	2	C
Frequency & % grade of pass, failures, withdrawals -	Tasmania	Student Admin. & Statistics	Depts., Facs, Prof. Board, Council	analysis & enrolment forecasting	2	C
Levels of passes and pass rates in each subject	Woll.	Stats Officer	Senate, Depts	information	2	M
Pass rates & % students gaining graded passes in each course as recommended by Schools with totals	Macq.	Stats Office	Schools, Senate	review results prior to release to studs	2	C
Overall exam performance of undergrads by type & year of attendance - credit points entered v. gained & % gaining zero, all points and passing year.	Macq.	Stats Office	Schools, Senate	review students' progress	2	C
Summary by subject - annual and deferred	N.S.W.	Stats.	Fac Coms., Prof. Board	review & assessment	3	M/C
Summary by subject (total enrolments, withdrawals, results)	A.N.U.	Management Services Group	Heads of Depts	review of grading	1	C
Summary dissected according to subject and various student categories (e.g. home residence, sex, attendance)	A.N.U.	Stats. Officer	Heads of Depts., Facs.	general planning, Annual Report	1	C
Exam results by dept. each semester showing no. obtaining each grade and % pass on all dept. subjects	Qld.	Stats. & Data Processing	Committees	review	2	M/C
Undergraduate examination performance	Flinders	Stats. Section	Exam. Boards	overall review prior to release	3	C
Analysis of Exclusions	Monash	Acad. Reg.	Prof. Board	review exclusions	1	C/M

STUDENT INFORMATION - Progress of student cohorts

Main contents of report	Produced by		Used by	Use made of report	Frequency of production (per year)	Method of production
	Univ.	Section				
Analysis of current year's enrolment grouped by year of entry, number of years of study and whether studies interrupted	Adelaide	Admin. Computing Serv. Unit	Recent development - not yet used			C
Enrolment predictions based on year of entry	Adelaide	Admin. Computing Serv. Unit	Status Officer	Planning	1	C
Graduation rates by year of entry	Monash	Acad. Registrar	Prof. Board & Faculties	review performance of enrolling groups	1	C/M
x/x-1 ratios for use in projections of student enrolments	Sydney	Stats. Office	stats office	student enrolment projections and triennial planning	1	M
Course enrolments x course year 1961-197x	Melb.	Stats. Office	stats office	basis for projctns	1	M
Analysis of special entry students and performance in selected subjects	La Trobe	Student Affairs	Board of Studies	planning and implementation	1	C
Performance of mature-age students	N'cle	Sec's Div.	Admissions Com.	review performance	1	M
Year/stage analysis for bachelor courses - duration analysis for others	N'cle	Sec's Div.	Statistics	courses completed, measure progress	1	C/M
Provisional matriculants	Tasmania	Student Admis'ns	Admis. Com.	admis procedures	irregular	M
Undergraduates from year of entry	Tasmania	Student Admis'ns	still in preparation		irregular	M
Details to determine carry on and returning rates	Flinders	Stats section	Stats section	projection of student numbers	1	M
Progress to next year (contin. graduated, discont. etc.) of students by year of attendance, by program enrolled	Macq.	Stats Office	Senate	review output, guide for student projection	?	C
Progress (cont for degree in min time, longer, continuing, discont.) of u/grads who commenced in each year	Macq.	Stats Office	Senate	review output	2	C
Continuous record of student progress	A.N.U.	Stats Officer/ Office, Research Acad. Methods	-	in development		C/M
Enrolment predictions based on year of entry	Qld	Stats & Data Processing	Planning	planning	1	C/M
Time to graduation of graduates	Qld	Stats	Stats	review & publication	1	M
Performance of special entrants	Qld	Stats	Committees	review	irregular	M
Enrolment comparison matrix for each faculty for consecutive years, by course year and student type (new, old, transfer, prodigal, graduating, leaving)	Adel.	Admin. Comp. Serv. Unit	not yet used			C
Progression rates	Monash	Acad. Reg.	Prof. Board & Council	review performance	1	C/M

STUDENT INFORMATION - Relationship between entry qualification and university performance

Main contents of Report	Produced by: Univ.	Produced by: Section	Used by	Use made of Report	Frequency of production (per year)	Method of Pro-duction
Varies, mostly on a faculty basis	Adelaide	Acad. Registrar	faculties	admissions policies	1	M/C
Early leavers & special entry without matric.	Monash	Acad. Registrar	Prof. Board	review performance	1	M
Correlation between 'matriculation' and first year results	Q'ld	Statistics	Registrar	setting entry levels	irregular	M
Semester point scores & rescaled aggregates as indicators of academic performance	J. Cook	SAO (Ac.Serv)	Matric.Policy & Admis. Comm.	evaluation of existing policy	1	M/C
Academic performance of provisional matriculation	J. Cook	SAO (Ac.Serv.)	Matric.Policy & Admis. Comm.	evaluation of existing policy	1	M/C
Success/failure of student cohorts enrolled by different types of entry requirements, e.g. school matric, Principal's Report scheme, special consideration	U.N.E.	Educ. Res.Grp.	Admis. & Matric. Com., Prof. Board	planning methods for future intake	1	M/C
Entry and 1st yr. univ. perform of group entering via leav. & matric in previous year	W.A.	Research Unit in Univ.Educn.	Matric. & Admis. Com.	guide for determ admission criteria	1	M/C
School estimates of univ. perform. v. actual perform. in 1st year	W.A.	Research Unit in Univ.Educn.	Matric. & Admis. Com	guide for determ admission criteria	1	M/C
Performance differences among students entering in years 1969-73 based on aggreg. obtained in an ext.qual.exam.	W.A.	Research Unit in Univ.Educn.	Matric. & Admis. Com.	guide for determ admission criteria	1	M/C
Performance of adult matriculants & students transferred from other universities	Flinders	Academic Section	academic, school boards	academic review	1	M
1st yr. exam performance of new undergraduates related to HSC aggregate	Macq.	Stats Office	UGSC, Senate	review HSC aggreg. reqd for matric.	1	C
Progress of prov. matriculants admitted on basis of limited HSC program	Macq.	Stats Office	UGSC, Senate	review provisional matric.	1	C/M
Multiple regression analysis (e.g. GPA in 1st yr vs select. agg. age, CSSS scores)	Macq.	Stats Office	UGSC, Senate	review basis for selection	½	C
Students dissected by high school, HSC performance and 1st year university performance	A.N.U.	Stats Officer Admissions Off.	Faculties	general planning	1	C/M

STUDENT INFORMATION - Other

Main contents of Report	Produced by: Univ.	Produced by: Section	Used by	Use made of Report	Frequency of Production (per year)	Method of Pro-
Stats summary of student counselling & health consultations	Adelaide	Student Cnsellor/ Health Services	Registrar	Annual Report	1	M
Student contact hours by course	J. Cook	Inform.Pkg.Off.	VC Standing Com.	acad.staff establ.	1	M
Data on aver. size of 16, 17, 18 yr old pop., school retention, univ.ent.qual & univ.admis. in a number of Aust. states.	W.A.	Stats Section	Matric & Admis. Com.	guide to determine no. of students who should qualify for matric.	1	M
Frequency distribution agg. leav. marks for applicants	Murdoch	Acad. Adviser	Admiss. Comm.	guide in selection of students	1	C
Graduates roll,name, degrees held, address	Flinders	Stats section	Grad. Com.	info. to grads.coun-sel. Voting & to obtain employ.analysis	as required	C
Credit points gained (incl x field of study) of BA graduands	Macq.	Stats Office	Senate	review programs completed	1	C
Freq. distn of applicants for admission to U/G courses by selection agg. and 1st preference	NSW,Syd, Macq.	V.C.A.C.	admissions offices	planning offers	1	C
Graduates for previous year and estimate for next year	N.S.W.	Stats	Prof. Bd,Registrar	planning	1	M
Exam. timetable scheduling	A.N.U.	Stats Officer	Exams. Officer	preparation of exam. timetable	2	C

STAFF INFORMATION - Academic and Non-Academic staff records

Main contents of report	Produced by: Univ.	Produced by: Section	Used by	Use made of reports	Frequency of production (per year)	Method of production
Appointments and resignations	Adelaide	Staff Unit	Stats. Officer	statistics	12	M
Listings of academic and non-academic staff on annual appointments	Monash	Staff Branch	Staff Br., Deans, Dept. Chairmen	Renewal of appts	1	C
List of academic staff appointments due for review of contract	Monash	Staff Branch	Staff Br., Deans, Dept. Chairmen	Review appts prior end initial 3-year tenure period	2	C
List of staff approaching retirement	Monash	Staff Branch	Staff Branch	For communicating to Dept.Chairmen about vacancies or appls.appt extns	2	C
List short-term appointments	Monash	Staff Branch	Staff Branch	To notify Depts end short-term appts & prob.periods or review matters relating to individuals	12	C
Generalised interrogatory system to produce wide variety of reports, e.g. listings for cost of log of claims received from Trades Hall Council, listings for an actuarial valuation of the General Superannuation Scheme, information for Academic Salaries Tribunal and for costing exercises	Mona.	Staff Branch	Staff Branch	answer specific requests	as required	C
Summary of all estab. & filled positions for academic and non-academic staff by dept. Dissected by General & other funds; EAS by dept. plus faculty & univ. summaries; ratios of support staff to academic staff	Sydney	Stats Office & Accountants Staff	Sen.Admin.staff, Deans, Heads of Depts, Profs	resource allocn	1	M
Staff turnover	Melb.	Bursar	DVC/Bursar	To monitor seniority	1	M
No. of staff x classification x salary movements	Melb.	Bursar	DVC/Bursar	To measure cost increases of actual supplementation	4	M
Appraisal of salaries & position responsibilities	La Trobe	Staff Officer	Heads of Depts	determine salaries & promotions	1	M
Comparison of salaries and conditions in public and private institutions	La Trobe	Staff Officer, Industrial Offcr	Staff Officer Fin. Com.	determine staff salaries & condns	3	M
Staff appointments list	Griffith	Staff Officer	Divisional administrators	information	12	M
Staff probation list	Griffith	Staff Officer	Heads of Divs	confirmation of appointment	12	M
Staff changes and vacancies lists	J.Cook	SAO (Personnel Serv)	all Depts	information	52	C
Expiry dates - all staff	J.Cook	" "	SAO (Pers.Serv)	check on re-appt. & termination	12	C
Staff list with personal and pay roll information	U.N.E.	Staff Office, Pay Office	Staff Office Pay Office	payroll	26	C
Staff register, tenure expiry, confirmation date and retirement date listing	Murdoch	Personnel	Personnel Section	action on increments, tenure, expiry etc.	12	C
All relevant details incl. finance, position held, leave & tenure	Flinders	Staff Section	Staff & Finance Sections	promotions, study leave, tenure	updated continuously	M
Various reports prepared including vacancy statistics and other personnel records	N.S.W.	Bursar's Div.	VC, Pro VC & other sen.admin.staff	planning & control of staffing policies	12	C
Staff status cards showing name, date of birth, current position no., school & dept., classification, salary & range, effective date, account, date of appt.	A.N.U.	Management Services Group	Staff Office Business Managers	salary review, budgetary control	26	C

STAFF INFORMATION - Academic staff teaching contact hours

Main contents of Report	Produced by: Univ.	Produced by: Section	Used by	Use made of Reports	Frequency of Production (per year)	Method of Production
Staff-student contact hours in specific faculties	Adelaide	Admin.Computing Services Unit	Stats. Officer	determination of subject weightings	1	M
Teaching commitment of academic staff by subject	Adelaide	Departments	Staff dev.com.	for disestablishing existing posts and creating new posts	1	M
Contact hours for lectures,tutorials & practical work, hours for research, clerical work, excursions, administration	O'ld	staff members	"staff" com.	changing establishment, acad. salaries tribunal	1	M
Departmental summaries of annual use of working hours by academics collected from Heads of Departments	Sydney	Deputy VC	Deputy VC & sen. admin. staff	staffing	irregular	M
Unit/course, enrolment, student contact hours, annual teaching contact hours per department	W.A.	Heads of Depts	Staffing Com., Deputy VC	guide for alloc. of new acad. posns.	1	M
Undergraduate teaching per EAS by dept. within faculty	Tasmania	Sen.Admin.Off.	Exec, Prof. Bd	staffing & budget	1	M
Schedule of class contact hours for all teaching staff	N.S.W.	Heads of Schools	VC, Pro VC & other sen.admin.staff	planning teaching staff requirements	1	M
Schedule of class contact hours by schools and by classification of teaching staff	N.S.W.	Bursar's Division	VC, Pro VC & other sen.admin.staff	planning teaching staff requirements	1	M
Unit/course, enrolment, student contact hrs., annual teaching contact hrs. per school	Murdoch	Planning Officer	Resource Alloc. Comm.	staffing	1	M

STAFF INFORMATION - Establishment Monitor

Main contents of report	Produced by: Univ.	Produced by: Section	Used by	Use made of report	Frequency of production (per year)	Method of production
Approved and filled posts	Adelaide	Staff Unit	Staff Dev.Com.	Determination of staff establishment	1	M
Budget and expenditure on part-time teaching	Adelaide	Staff Unit	Staff Dev.Com., Departments	Use of P/T teaching funds	12	M
Appointments control report - a comparison between established posts and the occupancy thereof	Monash	Fin. Branch, Staff Branch	Fin. Branch Staff Branch	As a basis for certain forward estimates. Ensures appts within recurrent funds budget	12	C
"Staff Book" contains in coded form details of each staff member, the a/c from which he is paid, statistical summaries, etc.	O'ld	Staff	Staff, Reg, budget planning, "staff com", statistics	establishment control, staff stats, acad.salaries tribunal, changing establishment	10	C
Register kept for each dept on which each academic position is listed and occupant of each position noted	Sydney	Registrar's Office	Staff working on acad. appts		1 but amended each appt.	M
Annual/working budget for each position with budget $ for year and est. cost of occupant	Melb.	Bursar	Bursar,Budget Com. Facs, Depts	To show total funds avail & commitments	3	C
Staff book - listing of all staff	Griffith	Staff Officer	Divisional administration	reference purposes	continuously updated	M
Staff book - listing of all staff with personal and pay information	J. Cook	SAO (Pers.Serv)	SAO (Pers.Serv)	estab. review, budget, general stat. information	12	M/C
Establishment of all Departments	N'cle	Personnel Off.	VC, DVC, Bursar, Alloc. Com.	record & review of allocations	12	M
Staff establishment register	U.N.E.	Staff Officer	Stats Officer, Acad.Plan.Com, Admin.Staff Com.	planning future needs, staffing enquiries	1	M
Staff establishment register, summary of positions, position expiry listing	Murdoch	Personnel	Personnel Section	establishment control	1	C
Position number, rank, department	Tasmania	Budget Section	Budget, Pay & Personnel sectns.	establishment control	1	C/M
Positions available, vacant and filled	Flinders	Staff section	Alloc. Com.	establishment information	updated continuously	M
Personal details of occupants of each position	Woll.	Staff Officer	VC, Staff Office, Fin.Off, Bursar	general information	12	C
Approved non-academic staff est. by school/office incl current incumbent	Macq.	Non-Acad.staff office	Estab. & Promotions Com.	assist in eval. requests for add. staff	updated contin.	M
Approved acad.staff est. by-School incl. current incumbent	Macq.	Acad. Staff Office	D.V.C.	control establishment	updated contin.	M
Established positions and occupants incl. classification & other personnel details	N.S.W.	Bursar's Div.	VC, Pro VC,other sen.admin.staff, Deans, Heads Sch.	basis for decisns. affecting staffing	12	C
Establishment log report. Post framework on which is superimposed details of current & past occupants; estimated and actual occupancy by class, time and cost commitment, plus sundry stat. data	A.N.U.	Management Services Group	Budget & Stats. Offs., Business Offs.	preparation of estimates, resource alloc., monitor & control expend. & commit.	13	C

STAFF INFORMATION - Other

Main contents of report	Produced by: Univ.	Produced by: Section	Used by	Use made of report	Frequency of production (per year)	Method of production
Study leave records	Adelaide	Staff Unit	Study Leave Com.	study leave program	2	M
Study leave for current year and forecasts	La Trobe	Staff Officer	Study Leave Com.	planning for budget	1	M
Study leave entitlement - qualifying service to date for each eligible staff member	J. Cook	SAO (Pers.Serv)	SAO (Pers.Serv), Heads of Depts	planning future study leave	1	M
Evaluation of duties & responsibilities of all non-academic positions	W.A.	Staffing Office	VC	determine class	4	M
Staff granted study leave in next year	W.A.	Staffing Office	DVC	determin. study leave replacement	1	M
Recurrent and non-recurrent part-time teaching used in years by each department	Tasmania	Budget Officer	P/T Appt.Com. Prof. Board	recommendations re dept. allocation	1	M

FINANCIAL - Salaries budget

Main contents of Report	Produced by: Univ.	Produced by: Function	Used by	Use made of Report	Frequency of Publication (per year)	Method of Production
By department, actual & revised budget for previous year, budget for current year, difference on previous year, analysis of variations related to previous establishment, promotions/abnormal increments, staff development and estimated savings due to delayed appointments, resignations and later re-appointments	Adelaide	Bursar	Finance Com., Allocations Com.	determination of projected financial situations and other allocations	1 with review	M/A
Appointments control report - budget estab. comparison with actual filled positions with monetary values	Monash	Accountant	Heads of budget units	Appt. of staff, est. control	10	C
Allocation of salary cost to appropriate cost centres and comparison with approved budget	Monash	Accountant	Heads of budget units	control of expend. on salaries	10	C
Comparison of monthly salaries budget with actual salaries paid	Monash	Accountant	Fin. Com., Com. of Deans	Recurrent expend. control	10	C/M
Comparison of annual budgeted salary savings with anticipated savings	Monash	Deans	Fin. Com., Com. of Deans	Recurrent expend. control	4	C/M
Projection by established position of salary costs for financial year broken down into monthly allocations. Allows for vacancies, known resignations, new appts. increments, etc.	O'lld	Bursar	Budget Officer	basis for preparation of Univ. Budget & quarterly budget reviews	4	C
Estimated salaries costs with details of academic and non-academic salaries (FT & PT), estimated savings, superannuation and overtime, payroll tax and workers compensation insurance	Sydney	Financial Accountant	Admin.	costing and financial control	3	C/M
Position number, present occupant, classification, salary	Melb.	Bursar's Office	DVC, Budget Com., Fin. Com.	Departmental rpts, budget v. actual	3	C
Unplanned salary savings & position (w/i divisions)	Melb.	Bursar's Office	DVC, Budgets	Monitor changes from original estimate	12	M
Promotions, rises, reversions x position	Melb.	Bursar's Office	DVC, Budgets	Monitor changes from orig.estimate	12	M
Future annual cost of departmental staff	La Trobe	Finance Branch	Heads of Depts	future expenditure planning	1	M
Salaries budget x position within division	Griffith	Business Manager	Exec. Officers	control of positions	1	M
Full year of cost x cost centre & estim. savings due to resignations and delayed appointments	J. Cook	Budget Officer	Bursar	budget preparation	3	M
Increased costs due to approved variations in salaries	J. Cook	Budget Officer	Bursar	advice to Fin.Com.	as required	M
Monthly charge, cost to date, estimate of expenditure balance of year = total per year compared with original and revised budget	U.N.E.	Pay Office	Pay Office, Budget & Cost Controller	comparison with budget	12	C
Annual salaries budget - complete details of personnel and salaries expenditure	W.A.	Budget Officer	Staffing Off., Planning Off.	control appointments	1 (updated continuously)	M
Name and salary costs, full year and actual for current year and full year for ensuing three years	Tasmania	Budget Section	Budget Section	budget preparation and review	4	C/M
Staff commitments against annual vote. Comparison of actual - savings with budget	Flinders	Bursar	Budget Off, Bursar, Alloc. Com.	control expend., realloc. of resources	12	M
Total cost of salaries for year less savings	Moll.	Budget Officer	Bursar, VC	budgeting	12	M
Acad. staff report - status of est.positions (F/T), status of budget (P/T)	Macq.	Budget Officer	VC, DVC, Bursar	control of funds	8	M
Non-acad. staff report - status of est. positions (F/T), status of budget (P/T)	Macq.	Budget Officer	Bursar	control of funds	5	M
Projection & analysis of salaries, expend. & estimates of costs of filling vacancies	N.S.W.	Costing & Analysis Sectn.	VC, Pro VC, Assoc.Bursar	financial control	12	M/C
Payroll costing analysis - expend. this pay by staff w/i account	A.N.U.	Management Services Group	Business Offs.	supplement estab. log report	26	C
Cost of salary award variations report by staff w/i school & dept. account code, details of cost of each award, variation since start of triennium	A.N.U.	Management Services Group	Budget Office	revise allocs. measure cost inc.	as req.	C

FINANCIAL - Budget control

Main contents of report	Produced by: Univ.	Produced by: Section	Used by	Use made of report	Frequency of production (per year)	Method of production
Expenditure: Statement of actual (paid & committed) expenditure and balance available under each expense heading	Adel.	Finance Section	Bursar, Depts.	general budget situations	12	M/A
Income & Expenditure: listings of the various income and expenditure headings	Adel.	Finance Section	Bursar	general budget situation	12	M/A
Comparison of budget with expenditure commitment to date, indicating free or overdrawn balances	Monash	Accountant	Heads of Budget units	continuous expend. control	13	C
Summary review of est. income & expenditure for year	Monash	Accountant	Finance Com.	Review by com.	10	M
Allocation of est. recurrent income for ensuing year	Monash	VC & Com. of Deans	Council, Fin.Com., & Com. of Deans	overall control of recurr. expend.	1	M
Schedule of insurable risks with current & est. premiums	Monash	Accountant	Fin. Com.	review by com.	1	M
QUBAC - Q'ld Univ. Budget & Acctg Control System. Monthly statements showing expenditure & commitments against recurrent budget allocations or funds available in grant, bequest, donation or misc. a/cs. Facility to group according to major programs or by cost centres	Q'ld	Data Processing	Heads of Depts, Sections, Bursar's Office	Basis of monthly reports to Fin.Com. & annual fin.stats. Hard copy budget. Budget control of accounts	12	C
Funds allocated and expenditure under broad headings uncommitted balance available	Sydney	Divisional accountant	Admin.	basis for allocation of funds, control of expenditure	12	C
Available funds, commitments and balance	Sydney	Divisional accountant	Admin & Depts.	Prog. control of expenditure	12	C
Expenditure v. income: departmental votes, research funds	Melb.	Accountant	Depts, Budget Com, Fin.Com.	report on expend. levels	1-12	M/A
General university items of expenditure	Melb.	Bursar	Bursar	monitor changes from original estimates	as required	M
Progressive expend. of recurrent funds by dept. showing budget/actual comparisons, commitments. Total recurrent expend. summaries & stats.	La Trobe	Finance Branch	Heads of Dept., Fin. Com.	expenditure control & evaluations	12	M
Approved budget, expenditure, commitments, balance	Griffith	Business Manager	Exec. Officers & Div. Administrators	budget control	12	M/A
Expenditure against budget	Griffith	Business Manager	Fin. Com.	budget control	12	M/A
Estimated general fund income incl. latest estimate of effect of indexation on recurrent grant	Griffith	Business Manager	Fin. Com.	budget control	12	M
Review of approved budget allocation	J. Cook	Budget Officer	Bursar.	subm. to Fin.Com.	3	M
Sen. recurrent expend. x area of activity x major heads of expend. actual expend. year to date compared with budget	N'cle	Asst. Bursar	Bursar, Fin. & Personnel Com., Council	planning & control	12	M
Weekly transactions & report - New salary payments by acc.	A.N.U.	Manag. Serv. Grp.	Business Offs.	monitor expend. against budget	52	C
Allocations (incl. adjs), expend, commitments, balance uncommitted for recurrent, eqpt, refearch P/T tut.	N'cle	Acct. Section	Heads of Dept, VC, Bursar, Sec. P Planner, Librarian	check on expenditure regulate level of spending	12	M
Expenditure & income, summary & comparison budget with details of receipts & payments and commitment	U.N.E.	Budget Officer	Heads of Depts	dept. expend. planning	13	C
Consolidated income and expenditure summary	U.N.E.	Budget Officer	Sen. Officers, Budget & Adv.Com.	evaluation of financial position	9	M
Expenditure reports showing budget, allocations, expenditure and commitments	W.A.	Budget Section	Heads of Depts	expenditure control	12	C
Summary of income and expenditure - total funds, balances, commitments, expend./income for year	W.A.	Budget Section	Budget Officer or Accountant	Internal expenditure control	as required	C
Meter reading of PABX telephone units	W.A.	Architect's Office	Architect's Office	identify costs to be recovered	12	C
Budget allocations for all recurrent expenditure items & expenditure to date & income & expenditure report	Murdoch	Accountant, Finance Officer	Senate, Fin.Com, Staff Com, schools	control of expenditure	12	C
Each budget appropriation, original vote, previous review & current est. with detailed statements on some a/cs	Tasmania	Budget Section	Fin. Com.	review of budget estimates	4	C/M
Monthly departmental accounting reports	Tasmania	Budget Section	Depts.	review expend.	12	M
Commitments against annual vote. Expenditure, outstanding commitments, free balance	Flinders	Bursar	Budget Off, School Chmen, Res.Com., Finance Com.	control of expenditure	12	A/M
Budget v. expenditure	Woll.	Budget Officer	Bursar, VC, Fin. Com., Budget Adv. Com.	budgeting	12	M
Recurrent funds budget report - status of budget to actual, salaries and general expenses	Macq.	Budget Officer	Bursar	control of funds	10	M
Report on recurrent funds - status of budget to actual, by major expenditure categories	Macq.	Bursar	Fin. Com.	control of funds	2	M
Status of individual accounts	Macq.	Budget Officer	Heads of Schools/ Offices	control of School/ office funds	10	M
Total recurrent expenditure & income review	N.S.W.	Costing & Analysis Section	VC, Pro-VC, Registr., Bursar	financial control	12	M/F
Report of school & faculty expend. & commitments against recurrent funds, spec.res.grant, eqpt grant, library alloc.	N.S.W.	Asst. Bursar	VCAC, Heads of Schools	financial control	12	M
Comparison of estimates and actual income by account	A.N.U.	Management Services Group	Budget Off, Business Offs.	budgetary control	13	C
Commitments and payments report - New salary transactions by account	A.N.U.	Management Services Group	Business Offs.	monitor commitment against budget	13	C

FINANCIAL - Investments

Main contents of Report	Produced by		Used by	Use made of report	Frequency of production (per year)	Method of pre-position
	Univ.	Position				
Investment positions - short-term deposits and superannuation and invalidity funds	Adel	Investments Officer	Fin. Com., Invest. sub.com.	Review investments	12	M/A
List of stocks in which it is proposed to deal	Adel.	Professional Invest.Advisers	Fin.Com., Invest. sub.com.	Review investments	4	M
Report on the equities market & the transactions of the equities portfolio	Monash	Accountant	Fin. Com	review investments	2	M
Listing of investments in shares & debentures at book value and market value	Monash	Accountant	Fin. Com.	review investments	2	M
Schedule of investments showing maturity dates, rates of interest, nominal value and purchase price	Q'ld	Deputy Bursar	Bursar's Office	ad hoc reports to Investments Com., cash flow projects, invest. planning	4	A
Detailed listing of all investments incl. market value	Sydney	Investment Officer	Accountant	support for annual accounts	1	M
Detailed listings of share portfolio	Sydney	Univ. stockbroker	Fin.Com.,Invest. & ment Offic'n	Portfolio review	4	C
Variations (by sale, realisation or purchase incl. interfund transfers)	Sydney	Investment Officer	Fin. Com.	ratification of invest.decisions	12	M
Listings of investments by fund, type, company history, rates of return over 10 years, rate of growth, cost, market value	Melb.	Accountant	Fin.Com.,Investmts Com, Provident Fund Com.	determine investment policy & control, disbursement of income	12	C
Report on liquidity and return on short-term investments	La Trobe	Finance Branch	Fin. Com.	control of funds	12	M
Cash balance, bank balance - short-term investments	La Trobe	Finance Branch	Bus. Mgr.	investmt decisions	250	M
Schedule of investments & earnings from short-term investments	La Trobe	Finance Branch	Fin. Com.	decisions on future investments	12	M
Review of existing portfolio & proposals for new investments	J. Cook	SAO (Fin.Serv)	Investmt Com.	submissions to Fin.Com	3	M
Investments purchased during the month and on hand at the end of the month	N'cle	Asst. Bursar	Fin & Personnel Coms, Council	control	6	M
Schedule of monthly variations	U.N.E.	Finance Officer	Fin. Com.	ratify & information	12	M
Schedule of all investments	W.A.	Estates Office	Invest & Endow. Com.	review investments	1	M
Schedule of short-term investments	W.A.	Bursar's Office	Invest & Endow. Com.	review short-term investments	10	M
Total investments and earnings	Murdoch	Chief Fin. Off.	Finance Com.	information	as req'd	M
Cash balance, bank balance, short-term investments	Flinders	Bursar	Accountint Finance Com.	cash control & investment of surplus funds	250	M
Investments made for period, investments retired together with interest earned	Woll.	Finance Off.	Bursar, Finance Com.	review investments	6	M
Report on short-term and fixed-period deposits	N.S.W.	Asst. Bursar	Finance Com.	approval of investments	6	M
Progressive cash flow	Monash	Accountant	Comptroller	invest. planning	12	M

FINANCIAL - Trading and quasi-commercial activities

Main contents of Report	Produced by		Used by	Use made of Report	Frequency of production (per year)	Method of pre-position
	Univ.	Position				
Annual financial reports of Halls of residence, Union, Univ. Bookshop, Computer Centre, Centre for Continuing Education	Monash	Accountant	Appropriate Management Com., Finance Com.	Review of trading results for policy making	1	C/M
Sydney University Press trading statement	Sydney	Divisional Accountant	Board of S.U. Press	Assessment of fin. position	12	M
International House receipts and disbursements	Sydney	" "	House & Fin.Com.	" " "	6	M
Selle House annual statement of receipts and payments	Sydney	" "	House Com.	Basis of budget	1	M
Income and Expenditure Reports	La Trobe	Finance Branch	Area Manager, Fin. Com.	Financial control	12	M
Bookshop - operational budget & trading results	J. Cook	SAO (Fin.Serv)	Bookshop Man.Com.	submission to Fin. Com.	1/3	M/A
Annual report of Univ.bookshop Board of Management	W.A.	Bookshop	Senate	review & evaluation	1	M
University Press - sales progress, recovery of publication costs, Manuscript & production progress	W.A.	Press	Board of Management	review, sales, publishing, finance	12	M/A
Press sales summary & inventory listing	A.N.U.	Management Services Group	Press management	monitor sales by region, est. re-print nos.	13	C
Student Union and staff centre - liquor trading and stocks	A.N.U.	Management Services Group	Student Union Staff Centre Man. Accts. Branch	stock control, assess profitability	52	C

FINANCIAL - Capital Works

Main contents of Report	Produced by: Univ.	Produced by: Section	Used by	Use made of Report	Frequency of production (per year)	Method of Production
UC Funds: operational reports of each project as to current works valuation with the corresponding actual payment, and projection of two following quarters (includes equipment)	Adelaide	Finance Section	State Treasury & U.C.	-	4	M/A
Other than UC Funds: operational reports of each project as to current payments, commitments and balance	Adelaide	Finance Section	Source of funds	Control & review	4/12	M/A
Individual budget for each building project, capital, minor works and site works	Monash	Buildings Officer	Buildings Com. Finance Com.	review of capital expenditure	4	M
Pictorial bar chart on time scale for construction program	Monash	Buildings Officer	occupying depts. Bldgs Com, U.C.	review & development planning	4	M
Detail of minor works & maintenance orders placed, completed and in progress	Monash	Buildings Officer	Buildings Com.	review by com.	1	M
Grant, income received, expenditure to date & anticipated for next quarter	Monash	Accountant	U.G.	requesting grant income	4	C/M
Statements of commitments and expenditure by project	Q'ld	Bursar	Bursar's Office, Director Bldgs & Grounds	Quarterly reports to UC requesting advances, Financial control of projects	12	C
Funds received and expenditure incurred in respect of buildings, etc. defined in Acts	Sydney	Financial Accountant	Deputy Principal, U.C.	reporting use & request for funds	4	C/M
Building & equipment expenditure reports	La Trobe	Finance Branch	Finance Branch	basis for claiming gov't funds	4	M
Cash flow predictions of capital buildings programs	La Trobe	Buildings Branch	Buildings Com., Finance Branch	cash flow planning	as req'd	C
Budget heading & expenditure to date by project	Griffith	Business Manager	Site & Blds Mgr, S&B Com, Fin.Com.	Budget control	12	M/A
Actual expend. for each project x expense type compared with grants available	N'cle	Asst. Bursar	Fin.& Personnel Com., Council	control	6	M
Expenditure and income summary	U.N.E.	Budget Officer	Sen. Officers, Fin. Com.	expend. planning	13	C
Progress & financial report on capital works program	W.A.	Architect's Office	Buildings Com.	basis for policy decisions	11	M
For each building project, authorised cost, expenditure and commitments	Tasmania	Budget section	Buildings Com., Arch. Branch	decision making in building program	12	M
Commitments and anticipated expenditure against grant	Flinders	Bursar	Fin. Com., U.C. Budget Off.	control of expend. basis for progress pay	4	A/M
Allocation - expenditure and commitments	Woll.	Admin. Off., Estates	Estates Manager, B & G. Com.	control	12	M
Capital grants (per project) status	Macq.	Finance Division	Bursar, Arch-Pl.	control of expenditure	11	M
Capital grants - quarterly assessment of funds requirements	Macq.	Finance Division	Bursar	control of funds, basis for quarterly requests for payment of grants	4	M
Schedule of expend. expected to be incurred during current & following quarter & progress of capital program	N.S.W.	Asst. Bursar, Property Section	NSW Univ. Bd., Aust. Govt.	request for capital funds	4	M
Weekly and 4-weekly reports included in budget/financial accounting and reporting system	A.N.U.	Management Services Group	Accts., Property & Plans. Div.	monitor expenditure	13/52	C
Progressive cash flow on capital works	Monash	Accountant	Comptroller & UC	management of funds	4	M

FINANCIAL - Grants

Main contents of Report	Produced by: Univ.	Produced by: Section	Used by	Use made of Report	Frequency of production (per year)	Method of Production
Payments, commitments and balances	Adel.	Finance Section	recipient	control of spending & variation requests	12	M/A
Annual accountability statements	Adel.	Finance Section	grantors	-	1	M/A
Financial statement of detailed expenditure of individual grants received incl. ARGC, NHMRC	Monash	Accountant	grantors	acquittance of grant	1 or 2	C/M
QUBAC used - (see under budget control)	Q'ld	Bursar	Bursar's Office	control of research projects, bequests & donations a/cs. Rpts to granting bodies	12	C
Funds allocated and expenditure incurred shown by headings approved by granting body	Sydney	Divisional Accountant	Heads of Depts, Granting body	reporting use of funds, appln for renewal grant	2	M
Lists of bequests gifts & grants, cumulative by month, by donor with comparable figures for previous years	Melb.	Accountant	Council, Dept.Hds, Fin. Com.	monitor gifts, grants & bequests	12	C
Progressive expenditure reports	La Trobe	Finance Branch	recipient	expenditure decision	4	M
Income and expenditure reports	La Trobe	Finance Branch	grantor	evaluation	1	M
Grant, commitment, balance	Griffith	Business Manager	Div. Administrator & recipient	budget control	12	M/A
Report on bequests, donations and other funds	J. Cook	SAO (Fin.Serv)	Fin.Com.	submission to C'ncl	10	M
Details of grants rec'd, expend, commitments, balance	N'cle	Accts section	Heads of Depts, grantors	check finance posn of grant	12	M
Income and expenditure reports	U.N.E.	Budget Officer	Heads of Depts	expend., planning	13	C
Summary of research workers by dept.	W.A.	Research Section	Univ.Res.Com.	basis alloc.res. grants	2	M
Research grant allocation & expenditure to date	Murdoch	Accountant	grantees	control of expend.	as required	M
Statement of income & expend. for donations by various bodies	Tasmania	Budget Section	grantors	acquitting grants	1, 2 or 4	M
Commitments against grant income, expenditure, outstanding commitment free balance	Flinders	Bursar	Bursar, grantee, grantor	control of expend. against grant	12	A/M
Revenue - expenditure and commitments	Woll.	Finance Office	Finance Com.	control of expend.	6	M
Expenditure against each grant	N.S.W.	Asst. Bursar	Finance Com.	approval of expend.	4	M
Weekly and 4-weekly reports included in budget/financial accounting and reporting system	A.N.U.	Management Services Group	Accounts, Business Offs.	monitor expenditure	13/52	C
Salary cost analysis report	Monash	Accountant	grantees and grantors	control of use of funds	13	C

FINANCIAL - Other

Main contents of Report	Produced by: Univ.	Produced by: Section	Used by	Use made of Report	Frequency of production (per year)	Method of Production
Comparative statistics, financial & quantitative, of Monash and similar sized universities	Monash	Stats Officer & Accountant	Finance Com.			
Schedule of all internal charges, rentals current and proposed for the future	Monash	Accountant	Finance Com.	setting of rates	2	M
Schedule of all established rates for reimbursement of staff expenditure, e.g. subsistence, travel	Monash	Accountant	Fin. Com., Com. Deans	setting of rates	1	M
Library financial statement - progressive expenditure plus outstanding commitments on books, binding & periodicals with budgeted provisions. Detailed by departments and/or branch libraries	Monash	Librarian/ Accountant	General Library Com.	Budgetary control of dept'nt1/branch lib. allocns., approved by Gen. Lib. Com.	12	C/M
Stores - stockholding of items carried by store, items at re-order point, automatic charging to depts for items requisitioned from store	Q'ld	Data Processing	Stores Officer, Bursar's Office	management of store, internal control	12	C
QUBAC - item code analysis. All transactions are coded to indicate the type of expenditure or revenue involved. This data is stored and reports are prepared showing item codes within accounts or accounts within item codes	Q'ld	Bursar	Heads of Dept, Bursar's Office	inter-year comparisons. Budget control & prep., basis for alloc. of resources	3	C
Outstanding orders, showing commitment still outstanding (sub-system of QUBAC)	Q'ld	Bursar	Heads of Dept.	Budgetary control creditor's control	2	C
Interest - calculates, after allowing for capital holdings, and apportions to each eligible account its share of 'pool' interest earned on the investment common fund	Q'ld	Bursar	Bursar's Office	allocates interest to bequest, donation & special grant a/cs	2	C
Overtime - shows hours worked by each staff member each month and total cost to date. Compares amount budgeted and spent for each dept & section	Q'ld	Bursar	Dept. Bursar & Registrar	to control overtime	12	C
Schedule of student loans from stud. fin. asst. fund	U.N.E.	Finance Officer	VC, Co-ord. of Ancill. Serv.	establish & assess movement of fund uses and level of fiscal need	2	M
University workshop operations	W.A.	Architect's Off.	Buildings Com.	review policy	1	M
Detailed list of equipment - supplier, cost etc.	Flinders	Bursar	School C'ttees section heads	control of equip.	12	C
Statement of cumulative expend. & commitments on maintenance and on furniture	N.S.W.	Property Sect.	Business Manager	review of expend.	12	M/C
Anal. by hours & units, rates & total cost of P/T lecturing & marking	N.S.W.	Asst. Bursar	Deans	financial control of P/T teaching	12	C
Estimates of recurrent expend. by school/dept., for new staff, P/T teach., study leave, equip. etc.	N.S.W.	Asst. Bursar	VC, Pro-VC, Deans	annual fin. alloc.	1	M
Statement of items of expend >$10,000	N.S.W.	Asst. Bursar	Fin. Com.	approval of items	5	M
Report on maintenance expenditure by jobs	A.N.U.	Man. Ser. Group	Prop. & Plans Div.	scheduling & control	13	C

LIBRARY - Reader Services Statistics

Main constituents of Report	Produced By		Used By	Use made of Report	Frequency of Production (per year)	Method of Production
	Univ.	Section				
Loans dissected by branch, class of borrower and type of loan	Monash	Branch librarians	Univ. Library, Library Com.	Advance staffing & materials est.	12	M/C
Loan statistics	Q'ld	Administration Librarian	Univ.Librarian	Annual report, planning future staff, financial needs	1	M
Inter-library loan statistics	Q'ld	Administration Librarian	Univ.Librarian	Annual report, planning future staff, financial needs	1	M
Work report of reader services division incl. time worked, loans, reservations, researches	Sydney	Dept. Heads	Associate Lib. (Reader Service)	monitoring of Div's operations, planning annual report to Lib.	3	M
Loan statistics	Melb.	Librarian	Librarian	measure work load	300	M
Loan statistics	La Trobe	Reader Serv.Lib.	Chief Librarian	assessment of staff & service needs	4	M
Loan statistics in each category	Griffith	Library Manager	Univ.Librarian	datm.pattern of lending, help datm. staffing	12	M
Statistics of loans & inter library loans	J. Cook	Reader Serv.Libr.	Univ. Librarian	internal & for requests	12	M
Statistical list of book/periodical and other library holdings and loans/borrowings, etc.	U.N.E.	Librarian	Lib. Com., Staffing Com.	planning lib. development & staffing	1	M/C
Loans - interlibrary, reserve and main collection	Tasmania	Library staff	Library Admin.	planning staff & reader needs and accommodation	monitored daily,totalled annually	M
Reference enquiries, seat occupancy and use of computer based information services	Tasmania	Library staff	Library Admin.	planning staff & reader needs and accommodation	monitored daily,totalled annually	M
Loan statistics, incl. inter-library loans	Flinders	Reference staff	Librarian	planning prep. of budget subm,studies of work load	250	M
Reader attendance statistics	Flinders	Reference staff	Librarian	planning prep. of budget subm,studies of work load	250	M
Photocopying statistics	Flinders	Reference staff	Librarian	costing,planning	12	M
Loans and other reader service statistics	Woll.	Reference Lib.	Librarian, VC, Heads of Depts.	information	1	M
Loans by category of borrower	Macq.	Library	Library, Univ. Admin., UC	workloads, use of collection analysis	250	C/M
Inter-library loans	Macq.	Library	Library, Univ. Admin., UC	work-load analysis	250	C/M
Loans by broad subject area	Macq.	Library	Library	use of collection	2	C
Overdue statistics	Macq.	Library	Library, Univ. Admin.	work loads, effect of various sanctions	12	C
Persons passing through exit door	Macq.	Library	Library, Univ. Admin.	workloads, hours of opening	250	electric counter
Material shelved	Macq.	Library	Library	building planning, workloads	250	M
Volume of photocopying	Macq.	Library	Library	finance	250	counters
Items on student reading lists, number of reading lists rec'd and number of items placed in reserve collection	Macq.	Library	Library, Univ. Admin.	advice to acad. staff	52	C/M
Loans from special reserve	Macq.	Library	Library	management	52	counter/M
Services to external students (requests rec'd, etc.)	Macq.	Library	Library, Part-Time Studs Cent.	management	2	M
Work performed in various categories (e.g. fine cancellations, reports typed, etc.)	Macq.	Library	Library	management	250	M
Reference enquiries	N.S.W.	Libraries	Univ. Librarian	monitor activities	12	M
Reader education, circulation, incl. inter-library loans, photocopying	N.S.W.	Libraries	Univ. Librarian	data for planning	12	M/C
Inter-library loans	Murd.	Library	Librarian & Reader Serv. Lib.	work load analysis	12	M
Loans by category - external borrowings, reserve, journals, general	Murd.	Library	Librarian & Reader Serv. Lib.	use of collection analysis, assess borrowing period	12	M

LIBRARY - Technical Services Statistics

Title/nature of report	Produced by		Used by	Use made of report	Frequency of production (per year)	Method of Presentation
	Lib.	Section				
Intake monographs, periodicals & microforms	Monash	Tech.Serv.Dept.	Univ.Librarian	staff development, systems & space planning	12	M
Cataloguing, output and location of output (books, etc.)	Monash	Tech.Serv.Dept.	Univ.Librarian	staff development, systems & space planning	12	M
Expenditure dissected by form and subject area (dept.)	Monash	Tech.Serv.	Univ.Librarian, Library C'tees	Budget planning and control	26	C
Statistics of monographs, serials, A/V, microform and other non-book material obtained by purchase or gift	Q'ld	Administration Librarian	Univ.Librarian Accts. Officer	Ann. Report, planning future staff & fin.needs, publns.	1	M
Work report of technical services division incl. time worked, acquisitions, cataloguing, binding, requisitions, orders, accessions, gift & exchange	Sydney	Dept. Heads	Librarian, Asst. Libn. (Tech. Serv.)	monitoring of the Div's operations, planning, annual rept to Librarian	3	M
Unit cost data	Sydney	Data operated by T.S. staff	Assist.Librarian (Tech.Serv.)	Planning, work flow review	irregular	C
New periodical expenditure by subject	Sydney	Acq. Librarian	Assist.Librarian (Tech.Serv.)	budgeting	irregular	M
Subject breakdown of new books catalogued	Sydney	Systems Office	Assist.Librarian (Tech.Serv.)	planning	irregular	C
Acquisitions: Commitment & expenditure & budget x fund x category of material & x category of material x fund x dept.	Melb.	Accountant	Librarian, Lib. Com.	management of the budget	12	M
Accessions: category of material x dept x volumes	Melb.	Librarian	Librarian	stock & aid to calc av. costs	12	M
Cataloguing x type	Melb.	Librarian	Librarian		12	M
Filing: Section x cards x sort time x file time	Melb.	Librarian	Librarian	monthly averages	250	M
Acquisitions statistics	La Trobe	Selection Lib.	Chief Librarian	assess future acquisition	4	M
Number of items catalogued by category	Griffith	Catalog.Lib.	Univ. Librarian	staff utilisation	12	M
Ordering stats - orders placed by category & committed expenditure	Griffith	Purchasing Officer	Univ. Librarian	budget control	12	M
Stats of acquisitions & cataloguing & binding	J. Cook	Tech. Serv.staff	Univ.Librarian	internal & for requests	12	M
Statistical list of orders, acquisitions, cataloguing, binding, etc.	U.N.E.	Librarian	Lib.Com., Staffing Com.	planning Lib. develop. & staffing	1	M/C
Titles and volumes added to collection	Tasmania	Catalog. Section	Library Admin.	planning developmt	12	M
Orders placed for new materials and funds committed	Tasmania	Acquis. Section	Library Admin.	planning developmt & financ. control	12	M
Orders placed, accessions, payments	Flinders	Acquis. staff	Librarian	budget preb, monitor expend. commit.	12	M
Titles and volumes cataloguing, additions, non-book material	Flinders	Catalog. staff	Librarian	planning, studies of work flow	52	M
Statistics of acquisitions and cataloguing	Woll.	Acquis.Lib & Sen. Cataloguer	Librarian, HC, Heads of Depts.	information	1	M
Materials added to collection, volumes catalogued, source of catalogued copy	Macq.	Cataloguing Dept.	Head Cataloguer, Librarian	analysis for work flow forecasting growth of collection, staffing	52	M
Acquisitions - statement of commitments/expenditure	Macq	Acquisitions	Acquis.Lib., Univ. Librarian	control expenditure	52	M
Orders and acquisitions & binding	N.S.W.	Acquisitions	Librarian	data for planning	12	M
Cataloguing and backlog	N.S.W.	Head Cataloguer	Librarian	data for planning	12	M

LIBRARY – Other

Main contents of report	Produced by: Univ.	Produced by: Section	Used by	Use made of report	Frequency of production (per year)	Method of production
Statement of a/c (Library book vote & other book funds)	Q'ld	Acquisitons Lib.	Heads of Depts	information	12	M
Annual report to the University Librarian	Q'ld	Univ. Librarian	Heads of Depts, Univ.Admin, other univ.libs.	information	1	M
Staff language ability	Sydney	Assist. to Libr.	Librarian	To obtain assist., foreign lang profs	1	M
Staff educational levels	Sydney	Assist. to Libr.	Librarian	personnel planning	1	M
Equipment purchased & maintenance expenditure past years	Sydney	Assist. to Libr	Librarian	budgeting	1	M
Bindings, no. of binds x type x library	Melb.	Librarian	Librarian	Measure workload	12	M
Expenditure & commitment, statistics; allocation, current balance, encumbrance & free balance for books, etc.	La Trobe	Admin.Asst.	Chief Librarian	decision making on expenditure	4	M/C
Report of the Univ. Librarian – account of year's events with reader and tech services stats	J. Cook	Univ. Librarian	Lib. Com.	information	1	M
Listing of all holdings	U.N.E.	Librarian	Depts.	course planning	12	C
Librarian's annual report – needs, use of resources & stats on holdings, reader & tech services	W.A.	Library	Lib. Com.	evaluate use of resources	1	M
Annual report of the Librarian, including statistics	Flinders	Librarian	Univ.officers & Committees	information	1	M
Aust. Univ. Lib. stats published in "Aust. Academic and Research Libraries"	All	Librarian	Libraries	information	1	M
Summary of developments in Library	Mell.	Librarian	Lib. Com.	source of comment on lib.activities & developments	12	M
Statement of expend. & commit. against library allocation per school, faculty	N.S.W.	Librarian	Lib. Com.	review of expend.	12	M
Allocation of library allocation to schools, etc.	N.S.W.	Librarian	Lib. Com., Deans	alloc. of funds	1	M
Re-shelving	N.S.W.	Libraries	Uni. Librarian	data for planning	12	M
Use of audio-visual materials	N.S.W.	Libraries	Uni. Librarian	data for planning	12	M
Systems printout of lists & cataloques, input of MARC data and updates	N.S.W.	Systems Librarian	Uni. Librarian	data for planning	12	M

FACILITIES – Utilisation of Teaching Space

Main contents of report	Produced by: Univ.	Produced by: Section	Used by	Use made of report	Frequency of production (per year)	Method of production
Lecture theatre timetable for the year	Monash	Fac. Sec.	Faculties & Publications Office	organisation of lectures	1	M
Classroom & laboratory timetable for each faculty	Monash	Fac. Sec.	Faculties	organisation of tuts & lab. classes	1	M
Hours of use per week, for classes of various size, for all lecture theatres & seminar rooms which are centrally allocated	Q'ld	Planning & Stats Section	DVC(FSF),Accom. Sub-com of Planning Com & Project Com.	Decisions on space reqd for centrally allocated teaching areas	1	M
Teaching rooms analysis by room & hour x density and by department location (proposed)	Melb.	Inventories Section	Buildings Dept.	monitoring usage, improve efficiency	1	M/C
Analysis of utilisation of teaching areas	La Trobe	O.I.C. Teaching areas office	Registrar, Teach. Areas Com.	recommending type & size of future teaching areas	intermittent	M
Details of new teaching space available	La Trobe	O.I.C. Teaching areas office	Registrar, Teach. Areas Com.	planning for class & exam t table & purchase of furniture & A.V.	as appropriate	M
Demand for lect & sem. facilities, compare needs with available assuming various rates of utilisation	W.A.	Planning Office	Bldgs Sub-Com., Bldg Project Com.	basis for recom. new facilities	as required	M
Utilisation of lecture theatres, seminar rooms & laboratories	Macq.	Stats. Office	Student Centre, Stats Office,DVC	basis for calculating spaces req'd in future years	1	M
Comparison of timetable accom. allocations against actual usage	N.S.W.	Property Sect.	Business Manager	availability of accommodation	ad hoc	M
Schedule of classroom, laboratory & seminar teaching accommodation and facilities	N.S.W.	Property Sect.	Interfaculty timetable & accom. com.	allocation of teaching accom. at start of each acad. year	1	M
Allocation of 1st year Science Classes	Adel.	Admin. Comp. Ser. Unit	Science Fac.	timetabling	1	C

FACILITIES - Assignment of space by department/office

Main contents of Report	Produced by		Used by	Use made of Report	Frequency of Production (per year)	Method of Production
	Univ.	Section				
Listing of rooms by building and of room by room function for each dept. or section showing description of use and dimensions of each room	Q'ld	Planning & Stats. Section	DVC (F&F) Accom. sub-com, Project Committee	allocation of space to depts/sections	1	C
Analysis by function within dept or section showing total number of rooms and area for each function	Q'ld	Planning & Stats. Section	DVC (F&F) Accom. sub-com	preparation & implementation of triennial building program	1	C/M
Rooms by dept w/i level, building showing use type, capacity, facilities	Melb.	Inventories Section	Buildings Dept.	general data & planning source	1	C
Rooms by dept & building with details of current use, space & special features; area sub-totals x bldg & total area allocation to department	W.A.	Planning Office	VC, Vice Princ. Bldg Project Com.	guide for determ. schedule of accom. for new bldg & alloc.in exist.bldg	as required	C
Office-type space requirements by school based on approved staff establishments	Macq.	Property Serv.Div.	DVC	discussions on space assignments	1	M

FACILITIES - Equipment Usage

Main contents of Report	Produced by		Used by	Use made of Report	Frequency of Production (per year)	Method of Production
	Univ.	Section				
Computer loading (by devices), usage (by department), accounts and financial statement	Adelaide	Computer Centre	Director, Departments	trends, control production	12	C
By department; expenditure, commitments and balance of equipment funds	Adelaide	Finance Section	Equpt. Com., Bursar, Depts.	policy review, variation requests	12	M/A
Detailed information on computer usage by dept. and by $s charged	Monash	Director Computer Centre	Director Computer Centre, Computer Centre Com.	review operations & charges	12	C
Plant, machinery & office equipment inventory	Melb.	Inventories Sectn	Depts/Auditor	internal control	1	M/C
Utilisation of centrally controlled A.V. equipment	La Trobe	Teach areas, Tech. officer	Registrar, Teach. areas com.	planning purchase new equipment	1	M
Usage of central computing system	La Trobe	Mge Computer Cent.	Computer Users Com.	overview of usage	12	C
Computer usage, times, numbers, etc.	U.N.E.	Computer Centre	Computer Com.	planning lecture usage & alloc. of time	3	M/C
Computer usage - analysis of time and charges	W.A.	Computing Centre	Bd.of Man.Comp. Cent.,Heads Depts Departments	basis for budget control, decision re charges & capital investment	12	C
Computer usage	Flinders	Computing Centre	Computing Com., Computing Centre	policy by Computing Centre	12	C
Computer usage by School/office	Macq.	Computing Lab.	Schools/Offices	budget control, prediction of demand	12	C
Computer usage by school for teaching & research	N.S.W.	Mgr. Computing Serv. Unit	Comp. Sc.Com., Prof. Board	computer resource allocation	4	M/C
Computer usage - analysis of time and charges	Well.	Computer Manager	Comp. Users Com.	review of usage	12	C

FACILITIES - Other

Main contents of Report	Produced by		Used by	Use made of Report	Frequency of Production (per year)	Method of Production
	Univ.	Section				
Plans of mechanical services for University campus	Melb.	Design & Operations	Buildings Dept.	services location	perpetual upd'g	M

REPORTS RELATING TO MORE THAN ONE SYSTEM - Student/Staff ratios

Main contents of report	Produced by: Units	Produced by: Centres	Used by	Use made of report	Frequency of publication (per year)	Method of Presentation
Student/staff ratios on approved/filled post bases	Adelaide	Stats. Officer	Staff Dev.Com.	determination of staff development	1	T
WSU, FT staff, amount of part-time teaching, FTE of part-time teaching	Adelaide	Stats. Officer	Staff Dev.Com.	consideration of staff development & disestablishment	1	M/C
EFTS/EAS (establishment) by department	Monash	Stats. Officer	Pro VC, Com.Deans	T & R staffing, resource distn	1	M/C
EFTS/non-academic supporting staff by faculty	Monash	Stats. Officer	Pro VC, Com.Deans	staffing distn	1	M/C
Ratio of W.S.U. to est. positions (FT & PT) & to filled positions (FT & PT) by department	O'ld	Planning & Stats section	Staff com.	publication & prep. staffing recommend.	1	C/M
Ratios for each acad. dept. with faculty & univ.summaries	Sydney	Stats Office	Sen.Admin.staff, Deans, Heads of Depts, Profs.	resource allocation	1	M/C
EFTS, EAS, SSR x Dept. w/i Faculty	Melb.	Stats Office	Deans,Budgets Com.	Planning	1	M
EFTS, EAS, SSR x school (dept)	La Trobe	Stats. Officer	Heads of Depts.	planning, acad. staff needs	1	M/C
Departmental profiles incl. relevant student & staff stats & ratios over past 4 years	J. Cook	Inf.Res.Off.	Standing Com.	acad.staff est.	1	M
Load/staff, scaled W.S.U./staff	N'cle	Sec's Div	VC, Alloc.Com.	staff allocations	1	C/M
SSR for each department	U.N.E.	Stats Officer	Acad.Plan.Com, Prof Bd.,Depts	staffing of depts	1	M
SSR & effects on SSR of changes in acad. staff est.	W.A.	Registrar's Office	Staffing Com.	guide alloc. new staff	1	M
SSR by dept. within faculty	Tasmania	Sen.Admin.Off.	Facs,Prof.Bd.	staffing, budget	1	M
Table of index of relative need derived from WSU report (staffing formula calculations)	Tasmania	Sen.Admin.Off.	Facs,Prof Bd.	staffing & budget	1	M
WSU by dept. & associated teaching ratios and SSR	Flinders	Stats/Staff Sect	Depts. Alloc.Com.	staff,budget review maintain. grants	2	C/M
SSR by department	Unil.	Fin. Officer	Bursar	formula allocation of acad. staff	1	M
SSR by School & field of study, actual & projected	Macq.	Stats. Office	Schools, Com.to Advise VC	guide in determ. academic staff	2	C
SSR by school	N.S.W.	Bursar's Div.	VC, Pro-VC,other sen.admin.staff	planning teaching staff required	1	M/C
SSR	A.N.U.	Stats. Off.	Deans, Sen. Manag.	guide to planning & operation	1	M

REPORTS RELATING TO MORE THAN ONE SYSTEM - Teaching load per full-time academic staff

Main contents of report	Produced by: Units	Produced by: Centres	Used by	Use made of report	Frequency of publication (per year)	Method of Presentation
Annual hours of lectures, seminars/tutorials and demonstrating/practical/clinical sessions for each subject taught. Estimates of preparation, marking & other work associated with teaching and of research, administration and other duties, average weekly contact hours per staff member, lecturer and above and all staff. Comparative charts set out in subject areas.	O'ld	Planning and Statistics Section	Staff Com.	Preparation of staffing recom.	1	M
Teaching loads per lecturer per tutor	J. Cook	SAO/Ac.Serv.	Standing Com.	acad.staff est.	1	M

REPORTS RELATING TO MORE THAN ONE SYSTEM - Recurrent expenditure/E.F.T.S.

Main contents of Report	Produced by		Used by	Use made of Report	Frequency of Production (per year)	Method of Production
	Univ.	Section				
Recurrent expenditure/EFTS by department	Adelaide	Stats.Officer	Vice-Chancellor	Planning	as required	M
Recurrent expenditure/EFTS by department, faculty	Monash	Stats Officer	Com. Deans, Finance Com.	review costs	1	M/C
Annual direct costs/EFTS in each department and for whole university	Q'ld	Budget Officer, Stats. Officer	Stats. Officer	comparative dept. cost studies	1	C/M
Teaching & Research costs funded from general a/c & UC research grant for each dept. grouped into faculties per EFTS for a particular year	Sydney	Accountant & Stats Office	Senior Admin. Officers	resource alloc., assessment of annual income required	irregular	M/C
General fund expenditure/EFTS x cat. of expenses: Dept. w/i Fac.	Melb.	Bursar	Bursar DVC, Budgets Com.	budget planning	1	M
Recurrent funds/EFTS by year	La Trobe	Stats. Officer	Admin., Heads of Depts.	use in planning	1	M
Recurrent expenditure/EFTS by department	Woll.	Bursar, Fin.Off.	VC, Res. Com., Budget Adv.Com.	budgeting	1	M
Recurrent expend/EFTS by School & by each major expense cat.	Macq.	Bursar, Stats. Office	DVC, Com.to Advise VC	guide in budget	1	M
Recurrent expend/EFTS	A.N.U.	Budget Off.	Sen. Manag.	guide to planning & resource alloc.	1	C/M

REPORTS RELATING TO MORE THAN ONE SYSTEM - Nett assignable space per E.F.T.S.

Main contents of Report	Produced by		Used by	Use made of Report	Frequency of Production (per year)	Method of Production
	Univ.	Section				
UC space inventory/EFTS, by department	Monash	Stats. Officer	Develop.Com.	Preparation UC rpt, review space needs	1	M
Nett usable floor area/EFTS for each department and section	Q'ld	Planning & Stats. section	Planning Com., Work.party on Accom, DVC(F&F)	Preparation of capital works sub., Reallocation of space	1	C/M
Usable area x Dept. w/i Fac. & Budget Division per WSU & EAS	Melb.	Inventories Sect.	Deans Com.,Bldg. Com, Central Bldg Plan Com.	allocation policy planning	1	M
Standards of space/EFTS as assigned to each dept., school & associated faculty, provided through revisions to the University master plan	La Trobe	Buildings Branch	Bldgs Com., Council	planning space requirements	1	M

REPORTS RELATING TO MORE THAN ONE SYSTEM - Other

Main contents of Report	Produced by		Used by	Use made of Report	Frequency of Production (per year)	Method of Production
	Univ.	Section				
EAS distribution formula (involves EFTS number, class sizes, year length factor)	Monash	updated by Stats. Officer	Pro V.C., Com. Deans	forward year staffing numbers	1	M
Faculty 'maintenance' distribution formula (involves EFTS numbers, $/EFTS, year length factor)	Monash	updated by Stats. Officer	Pro V.C., Com. Deans	forward year maintenance monies	1	M
Departmental summaries - student enrolment, WSU, academic and other staff, establishment, SSR & budget	W.A.	Stats. Section	Staffing Com.	guide for alloc. new staff	1	M/C

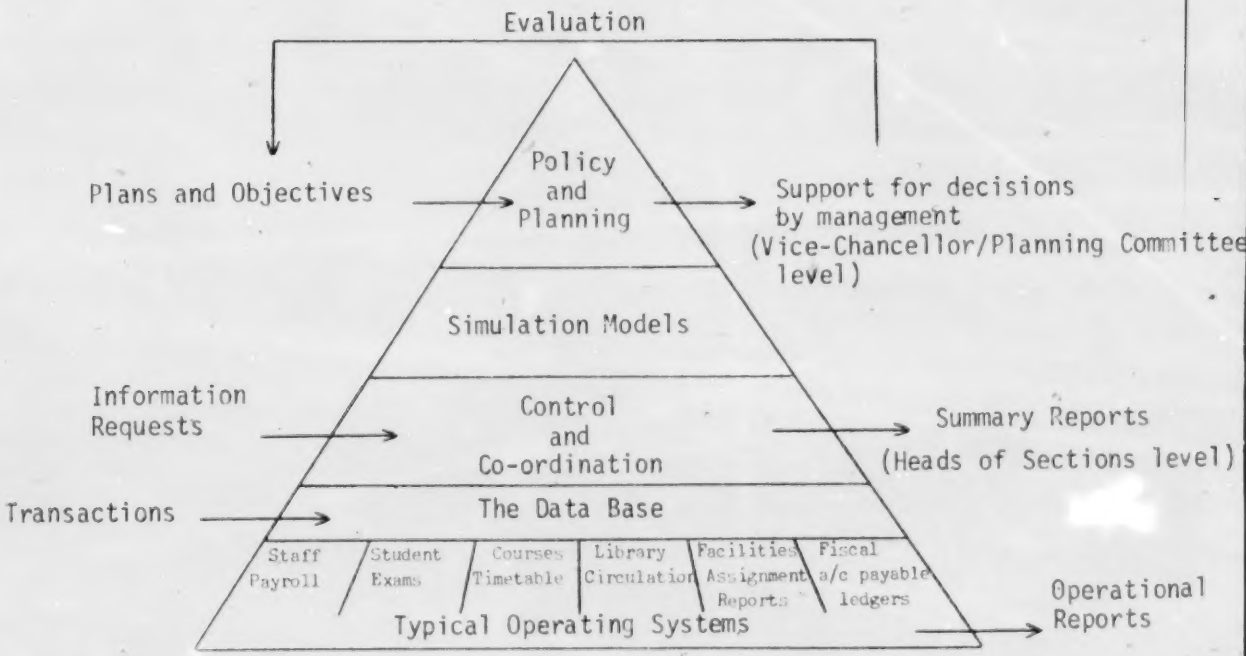
SUMMARY OF REMARKS MADE IN PRESENTATION

One of the difficulties associated with the Survey was just what was meant by "Management Information Systems". Discussion at the conference hopefully has clarified this to some extent. The definition I tend to look to is one by Walter Kennevan who defined the term as "an organised method of providing past, present and projected information relating to internal operations and external intelligence. It supports both the planning, the control, and the operational functions of an organisation by furnishing uniform information in a proper time frame to assist the decision process".

A schematic representation of a M.I.S. for a tertiary institution is shown in figure 1. At the base of the triangle are the typical operation systems - staff, students, courses, library, facilities and fiscal, and within each of these is shown a typical type of operation system, such as "exams" in the student information system. From the Survey it is apparent that most of the universities have progressed towards building up computer-based operation systems, probably the most well-developed being the student area. Out of the student system, for instance, operational reports are produced such as advice to students of their exam results, or to academic staff of the students in their courses. At the next highest level, control and co-ordination, summarising reports are produced such as the student load in each department, or examination pass rates. Only a few universities produce reports on the progress of student cohorts, or other output meausres. We shall be looking with interest at the sort of output measures which NCHEMS is trying to develop.

Only about four universities appear to have made any use of simulation models to assist in their policy and planning. Such models can provide a powerful tool for decision-makers to look at the likely implications of some of the actions proposed.

Figure 1.

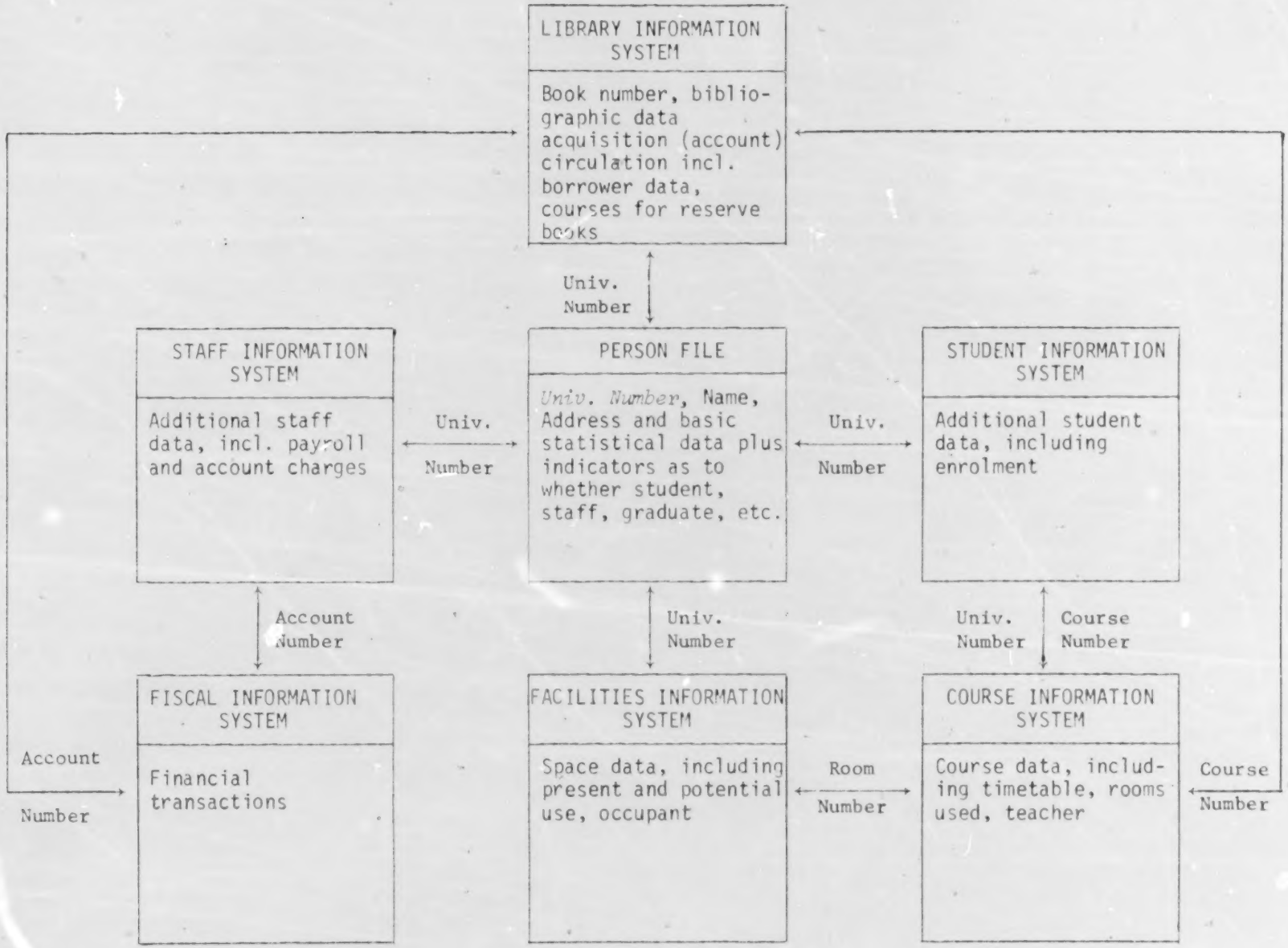


Schematic Representation of a Management Information System for a tertiary institution

No university is preparing a program budget. Some information has been extracted regarding recurrent expenditure per weighted student unit (WSU) by department but we do not know total expenditure incurred to produce graduates of the various programs.

The schematic diagram is not meant to indicate a total system. I agree with Dr. Lawrence that the development of a total system, certainly in the Australian universities at this stage, is very much an elusive and impractical goal. However, we should not lose sight of where we are going and eventually we are trying to provide information to assist in the policy and planning of the university, and to provide feedback to allow an evaluation as to how the university is meeting its plans and objectives.

At this stage it is quite clear that none of the Australian universities have a fully operational computer-based management information system. In the U.S. survey to which I have referred in the Survey, less than 1% of the institutions that responded to that survey had in fact a fully operational computer-based management information service. When I was in the States about two years ago, I did not see any, but perhaps my sampling was bad. I also understand from Dr. Lawrence that there have been quite dramatic developments in the last two years in this area, as he has indicated that universities have had to really look at their operational systems to be able to produce the information which is being required by legislature and which they probably needed anyway for their own internal management. Perhaps one reason for the lack of development in the Australian universities is that the management of universities tends to be on the "incremental/remedial" decision-making process, which Dr. Lawrence has described in his paper - and so the need for quantitative and analytical information is less than for the "comprehensive/prescriptive" approach. Another reason may well be our organisational structure. We are usually organised in units to process transactions so that we often have a Student Records Office, an Examinations Office, Purchasing and Payroll Offices. This makes the development of any sort of integrated system much harder because you have then got to cut the


LIBRARY INFORMATION SYSTEM
Book number, bibliographic data acquisition (account) circulation incl. borrower data, courses for reserve books
Univ. Number
STAFF INFORMATION SYSTEM
Additional staff data, incl. payroll and account charges
Univ. Number
PERSON FILE
Univ. Number, Name, Address and basic statistical data plus indicators as to whether student, staff, graduate, etc.
Univ. Number
STUDENT INFORMATION SYSTEM
Additional student data, including enrolment
Account Number
Univ. Number
Univ. Number
Course Number
FISCAL INFORMATION SYSTEM
Financial transactions
FACILITIES INFORMATION SYSTEM
Space data, including present and potential use, occupant
Room Number
COURSE INFORMATION SYSTEM
Course data, including timetable, rooms used, teacher
Account Number
Course Number

Schematic Representation of a Possible Data Base for a Tertiary Institution

lines of responsibility between sections and somehow make them inter-dependent rather than independent. There can often be extensive duplication of effort when each section develops its own independence. The inter-relationships between the various sets of data that are built up by the sections are also much harder to get at and to manipulate.

An illustration of this concept is represented in the schematic diagram of a possible data base for a tertiary instituion (figure 2). In the centre there is a "person" file with basic data about any person who is associated with the university with indicators as to the type of association (student, staff, graduate etc.). Each person would be identified by a unique number which would provide a link with the staff, student, course, library and faculties information systems. Account number, course number and room number also provide links between various sub-systems.

The systems can be developed independently so that, for instance, the student system provides all reports required for the Student Records Office.

One way an institution can increase its efficiency is by comparison with other institutions. At present these comparisons have had limited reliability because of the lack of any standard classification between the universities, particularly in the areas of faculties, schools, departments, areas of study and programs. And this is essentially the vital area. However, important comparisons are being made, notably by the Universities Commission. It does appear that we are now moving to develop data element dictionaries and standard classifications of programs, although there is still much work to be done. For instance, we need to decide what is the quantum to be used and what is included in each classification.

Dr. Lawrence has outlined for us the work that has been done in the management area in higher education in the U.S.A. particularly by NCHEMS. We note, however, that the NCHEMS budget grew from about half a million to about four million in about four years - and that only

includes the cost of NCHEMS itself - there has also been a considerable amount of money put into separate projects. It is astounding to us that about five million dollars was put into a project at Stanford University to build a total information system and the project was on the whole unsuccessful. Australian universities are not in the situation that we can afford to experiment to that sort of degree. However, I believe that we can move forward in this area. For instance, as far as the NCHEMS resources requirement prediction model is concerned, universities themselves can often do some work in this area. For example, at Macquarie we have developed a student-driven computer model, shown schematically in figure 3, which we feel is able to provide valuable information as a basis for planning, but not as a substitute for planning. Inputs to the model are:

- the present student enrolments in each program by year of attendance
- the inventory of our teaching space in terms of number and size of lecture theatres, tutorial rooms and different types of laboratories
- the present academic staff by School and by field of study
- the present non-academic staff broken up into the classifications used by the Universities Commission

By using assumptions of the progression and transfer rates for students in each program and the planned intake into each program projected enrolments and graduates in each program can be obtained. At this stage the "programs" recognised are fairly macro such as Full-time B.A., Dip.Ed., Full-time Ph.D., External Law etc.

These and other assumptions about students are based on data coming out of the operational student information system, so that we are able to look at actual data over, say, the last three years and try to look at what external factors might cause changes. Further assumptions transform enrolments in each program by years of attendance into enrolment by level of courses. For the graduate programs these are then converted to weighted student units (WSU) by use of the mean student load represented by full-time, part-time and external students in each program.

INPUT	ASSUMPTIONS	OUTPUT
• Present Student Enrolments in each program by year of attendance	• Progression/transfer rates for students in each program by year of attendance • Intake into each program	• Project Student Enrolments in each program by year of attendance • Projected graduates in each program
	• Relationship between years of attendance and levels of courses taken for bachelor degree candidates • Mean student load represented by Full-time, Part-Time and External students in each program by years of attendance • Assumed distribution of student load over Schools for each level of courses within each program	• Student load by School and discipline, level and class (Day, Evening, External)
	• Courses to be offered and for each course method of teaching and % of student load for School and level that will enrol in that course	• Course enrolment estimates
• Available teaching space (theatres, classrooms, laboratories)	• Utilisation rates of existing teaching space	• Lecture theatres, classrooms and laboratories needed
• Present academic staff by level and by School and discipline	• Parameters for calculating academic staff teaching load	• Projected academic staff establishment by School and discipline and level
• Present non-academic staff by activity and level	• Parameters for calculating non-academic staff	• Projected non-academic staff

"Student-driven" computer model developed by Macquarie University

Using the assumed distribution of the student load over Schools by level of course in each of the programs, the projected student load by School is obtained. For each course (subject) to be offered details are provided as to the method of teaching (number and size of lectures, tutorial and practical classes) and the percentage of the student load in the School and level likely to enrol in this course. This enables estimates of the enrolment in each course to be obtained. These estimates have proved to be valuable in the construction of the class timetable for the next year, for the bookshop in ordering textbooks and for staffing considerations.

Teaching space needs can be derived from the course estimates and teaching methods and the assumed utilisation rates for lecture theatres, classrooms and laboratories. This is an area where universities may need to achieve more efficient use by timetabling fully over the five days of the week.

To project academic staff requirements the model endeavours to break down the components that make up the teaching load and make a reliable estimate of the teaching load involved. By teaching load is meant all staff time committed to the teaching process, including scheduled classes, preparation, marking, development and revision, academic advising, course administration. Time spent on research, meetings or School or university administration is not included. Actual values can be given only to contact hours involved in formal scheduled classes. For other components the values used were based on information obtained in a survey. Heads of Schools collectively reviewed the values used for these parameters and agreed on whether or not some should be standardised across all Schools or whether there were valid reasons for having differences between some of the Schools.

As far as the non-academic staff are concerned, we used in the model a linear regression approach fairly similar to that used by Mr. Marginson. We found that there was a fairly linear relationship between the weighted student units of the department and the non-academic staff in that department. The danger in this approach is that you are

just perpetuating the current situation. At this stage we have not been able to set down what are the tasks which non-academic staff have to undertake and quantify these to measure the work required.

I have perhaps just touched on a few points arising from the Survey. I hope that it will indicate areas where one university may have something to offer others. I hope that it will make people aware of just what is going on in the area of management information in each of our universities. Questions about details of reports are best directed to the relevant university.

SUMMARY OF THE MAIN ISSUES RAISED IN DISCUSSION

Dr Lawrence indicated that, in the diagram on management information systems, NCHEMS was encouraging administrators to divide the section of the triangle referring to simulation models into two parts. In one section would be simulation models and in the other analytical procedures. Often decision making in higher education is on an ad hoc basis and many of the problems are dealing with discontinuous data. Simulation models often tend to reflect past history and have a fixed philosophical approach to solving the problem. NCHEMS was therefore trying to develop more flexible analytical tools to reflect more accurately the philosophies in higher education. Mr Findlay indicated valuable information for the policy and planning level can be obtained from analysis of the summary reports from the control and co-ordination level.

Dr Lawrence spoke of some of the indicators which were being tested for validity. For instance, he noted that State financial appropriations per student had been used widely as an indicator for many years. NCHEMS was now advocating that to consider financing of higher education by State a whole profile of indicators are needed because of the different objectives and level of funding per student of the different institutions in the State.

QUESTIONS FOR WORKING GROUPS TO CONSIDER AND REPORT

A. *INFORMATION NEEDS*

(i) For what decisions is information (qualitative and/or quantitative) needed?

(ii) What information is needed to assist in making academic and administrative decisions?

(iii) Is there any essential difference in information needed for planning and operation and control of an institution?

(iv) What information is needed to gauge the efficiency of operation of an institution?

B. *INSTITUTIONAL ORGANISATION*

(i) What structure and organisation is needed to generate and handle the information needs determined above?

(ii) Is there a need for a clearly defined role of a manager of information? At what level does this office operate in order to integrate data from many sectors?

C. *SOME PROBLEMS*

(i) If institutions move towards formula financing, what new demands for information arise?

(ii) What new concepts of information and information flows will be demanded of a university wishing to explore program budgetting?

D. *THE EXCHANGE OF INFORMATION AND CO-OPERATION IN THE DEVELOPMENT OF INFORMATION SYSTEMS*

(i) Is there a need to develop common language (a data element dictionary, for instance) to facilitate meaningful comparisons between institutions?

(ii) Is there a need for

(a) a clearing house for information?

(b) a mechanism for the exchange of existing systems?

(c) a process for co-operative exploration of ways of meeting system demands?

(iii) Is there a need for a central agency to develop needed concepts and systems?

(iv) In Australia, are clearing houses and development agencies best established at national, regional or city levels?

E. MEDIUM TERM PLANNING

What advice should this conference give to AVCC with regard to the development of the information management capabilities of universities over the next five years? What are the priorities?

REPORT OF WORKING GROUP A

INFORMATION NEEDS

Working Group A is of the opinion that question (i) unduly restricts the scope of information needed. Information at various levels of detail is required for all decisions but in addition factual information is needed to justify decisions made and to maintain the internal and external credibility of the decision makers.

Working Group A is of the opinion that universities already have available for the information of the Vice-Chancellor, the Governing Board and other decision-makers a great deal of the information on students, staff, income and expenditure, space allocation, and other aspects of university management. A great deal of this is prepared for the Universities Commission and other supplementary information is prepared by universities for their own internal purposes.

The Working Group is informed that a great deal of comparative data has become available in recent years, in part through the publications of the Universities Commission, in part through the bulletins issued through the Australian Vice-Chancellors' Committee, and in part through the special investigations undertaken by one or more universities. Such information is already affecting internal decision-making in many universities.

The principal difficulty with existing data is that the information has not always been prepared on the same basis in all universities, with the result that comparisons between universities may not always be valid. The Working Group is of the opinion that one of the principal needs is to increase the precision of descriptions and definitions at present in use and in particular that a review of the material reported in financial tables needs to be examined by an expert committee.

Difference between information for planning and operation and control

Much operational data is of value for planning purposes. The difference often lies in the use to which the data is put. For example, the date of birth of a staff member may be included for the purpose of giving annual increments or locating his retirement date, but by using it to give a distribution of the ages of staff members it could become an essential part of a planning operation on staff turnover.

The Working Group draws attention to the fact that special links may be necessary between existing operation systems if the data is to be used effectively for planning purposes. For example, most existing systems that contain information about staff members would not contain information on the subjects and classes they teach in the present year and the number of students enrolled in those classes. However, such information is needed if an integrated system is being developed which will provide management information on the usage of rooms and similar matters.

In developing information needed for planning, those developing the system must be able to identify the relevant variables and particularly those which "threaten the stability" of, and seem likely to result in future changes in, the system. If provision can be made for variables which may vary from year to year, the operational system can be readily adapted for planning purposes.

The Working Group was of the opinion that provision of information at present prepared for official purposes and of extra items such as those indicated in the papers by Mr Marginson and others would provide the principal information needed for informed judgments on the resource needs of various sections of the institution. The Working Group felt that insufficient time was available to explore the concept of "efficiency of operation".

INSTITUTIONAL ORGANISATION

Working Group A believes there is a need for a management information service in each university and that there should be co-operation between universities on the information to be sought. However, as universities vary in their size and their structure it does not believe that the present Conference is in a position to suggest the type of structure and organisation that would be needed in all universities. It believes that the structure and organisation developed in each should be appropriate to that institution.

There is clearly a need for a variety of information services within a university. There is a need to provide material for Parliament, for the Press, and in response to other public demands. There is the need to provide the specialised statistical planning data that typically comes through mechanised systems and is interpreted by a statistics officer. The question of who should be the person to define the type and level of detail in the information to be gathered and presented by the institution will vary. In some institutions and particularly the smaller ones, this may well be the Vice-Chancellor. In other institutions it may be a senior officer who could have a title such as manager of information.

Working Group A takes the position that sooner or later such a general position and role would emerge but that the definition of the role and the status of the person concerned will vary from institution to institution.

The Group accepted the view put forward by Mr Masters that the person concerned should be responsible to an officer at a high level and considered that there should not be more than one officer between the person concerned and the Chief Executive Officer.

SOME PROBLEMS

Working Group A did not have sufficient time to consider this question and considered that the time could be better spent on other issues.

THE EXCHANGE OF INFORMATION AND CO-OPERATION IN THE DEVELOPMENT OF INFORMATION SERVICES

The need to develop a common language

Members of Working Group A gave examples of the problems faced at present through the lack of a common language and common bases for classification. For example, one university found it very difficult to reconcile the number of staff shown on the payroll and on other staff systems.

Members were of the opinion that there were occasions when it was desirable to exchange cost information between universities and to analyse the available information published by the Universities Commission. As it was clear that this information was not always provided on a common basis, such comparisons were frequently lacking in precision and were at times quite misleading.

The Working Group was in no doubt that the major need is to describe and define more precisely the statistical and other terms used for comparisons between universities.

The need for a clearing house for information

Members considered that the work in developing a common language which is at present being undertaken by the joint committee of the AVCC and the Universities Commission in respect of students and staff would provide a common basis for this aspect of the task.

There were, however, other types of information that, if exchanged, would prevent unnecessary repetition of work already undertaken elsewhere.

Members suggested that one way of providing for exchange of this information would be for one section of the report submitted to the annual Administrative Staff Conference to contain a listing of special studies and reports -

(a) undertaken and completed during the past year
(b) at present being undertaken
(c) envisaged for the next year.

In addition to a listing of the types of study being undertaken there should be a brief comment on each.

A mechanism for the exchange of existing systems

This problem was discussed in relation to the Survey of Management Information Systems prepared by Mr Findlay for the present Conference and the similar smaller surveys he had undertaken in earlier years. Such surveys made it readily possible for those interested to see what was being done elsewhere and to make enquiries regarding systems of particular interest to them. Members were of the opinion that an extensive survey such as the present one might be undertaken perhaps every two or three years and that in the meantime significant additional activities could be listed in the annual report to the Administrative Staff Conference.

Co-operative exploration of ways of meeting system demands

Members were of the opinion that, in view of the fact that systems development is at a relatively early stage in most Australian universities, there should be special arrangements and funding to promote the interchange of information between universities.

One proposal was for a meeting of specialists such as statistics officers, but it was pointed out that the appropriate person to attend such a conference might not always be the statistics officer.

In response to a question as to whether it would be possible to devise a single system that could be used in several institutions the conclusion seemed to be that on many occasions universities were restricted by their existing procedures and regulations and that internal action might be necessary before the same system could be used by all.

Several members reported on the successful adoption of a system developed in one university by a second university. The examples related principally to financial systems. La Trobe, for example, is using certain systems developed at Monash. Griffith is contributing to the extension of the University of Queensland computer system, is using programs developed earlier, and has a member on the working party developing a major new system for payroll and other staff-related programs.

The need for central agencies and clearing houses

Working Group A is firmly of the opinion that it would be premature to create a very high-level institutional research group. In reaching this conclusion account was taken of the reasons for not so doing voiced by Professor Williams.

At the present time it appeared that the AVCC should be the central agency responsible for inspiring and developing needed concepts, systems and clearing-house activities. The Committee favoured the establishment of different specialist advisory groups for each project. These groups might report directly to AVCC or might report through the co-ordinating group under Professor Russell. The co-ordinating group should be given responsibility for overall supervision of the interchange of information.

The co-ordinating committee should also have a responsibility for ensuring that in enquiries undertaken by the Universities Commission or other groups the appropriate questions were asked.

PRIORITIES IN THE DEVELOPMENT OF MANAGEMENT CAPABILITIES OVER THE NEXT FIVE YEARS

Working Group A is of the opinion that the proposals appended to the address given by Professor Karmel were appropriate and might serve as the basis for similar joint AVCC/Universities Commission working parties in the future.

The Working Group was firmly of the opinion that the appropriate first step in the development of management information capabilities should be the development of data element dictionaries. These should include both a description and a definition of the data element and should indicate in some detail what the element included and did not include. In developing these data element dictionaries the priority should be

(a) students
(b) staff
(c) finance
(d) physical inventory (space, equipment)
(e) libraries.

In view of the lack of comparability in the interpretation of the existing Universities Commission document on financial information the Working Group is of the opinion that a specialist working party should be set up by the AVCC to review the financial information at present reported and should undertake this task in advance of the creation of any joint committee set up to prepare a data elements dictionary.

The Working Group draws attention to the very considerable expense to universities in amending a major system and suggests that once a data element dictionary is defined it should remain virtually unchanged, at least in that it should not require any major variation to the computer systems based on it for a period of perhaps five years.

The Working Group also recommends that the AVCC should be requested to proceed as an urgent priority with the suggestion of Professor Williams that special steering committees and clearing-house arrangements should be developed for the undertaking of special enquiries and the exchange of information.

REPORT OF WORKING GROUP B

Information Needed

Information will be needed for almost all decisions. More detailed information will be needed for operation than for planning where often external data is required such as demand for places, preferences of applicants and likely demand for graduates (manpower studies).

For control, information is needed to assess whether targets are being met. Such information could include student enrolments and actual expenditure as well as somewhat subjective data such as student and staff satifaction.

For operations, information could include contact hours of academic staff,which data could be useful in considering requests for new staff or deciding to disestablish some positions. The assets register is needed for insurance and data should be available on usage of equipment and expected life time. Data about major items of equipment available for use in other institutions could be important. Details of expenditure on maintenance even down to expenditure on various commodities can be useful for future planning.

Organisation

It is recognised that there are different organisational structures in universities; some are highly centralised, others highly de-centralised.

Some members consider that the Vice-Chancellor should play a substantial role in determining what information should be collected for management purposes. Persons in charge of major areas such as the Registrar and Bursar could be expected to advise on what information they considered appropriate.

If information is going to be used by a number of users it is important that there be co-ordination and some standardisation. Often the ADP section can assist because it is handling data for a number of sections. Also the ADP section can provide technical facilities to allow for links between systems to avoid duplication of effort.

Some Problems

Exploratory studies would be needed before any in-depth comments could be made about formula financing and program budgetting (see below).

Exchange and Co-operation

It was generally considered that comparative data between institutions would be required by institutions although it was recognised that the consequences of this data being available might lead to uniformity as value judgments will be hard to support. The group considered that comparative data will be extracted and it was probably better that this data be reliable in so much as common definitions were used in its derivation. It is therefore important to support the continued development of data element dictionaries in all areas: students, staff, facilities, finance and library.

SUGGESTION 1 : that the joint committee on computerisation of university statistics should be asked to develop a draft data dictionary for all areas. (Some additions to the membership of the group may be needed when different areas are being considered.)

SUGGESTION 2 : that there is a need to set up some mechanism to facilitate the exchange of computerised operational systems such as payroll, student records, library circulation. It is considered that perhaps the best way to achieve this would be for ADP Managers or other relevant staff to be asked by the AVCC to meet and devise a method of collecting data on operational systems developed in each institution. This would include developing some standardisation of documentation and considering the work of CAUSE.

SUGGESTION 3 : An evaluation of the applicability of the NCHEMS products for Australian institutions would also appear to be warranted. Dr. Lawrence indicated that it should only take about 2 weeks to put these up on a university computer installation so that test data could be run through. A report could then be prepared by a task group (perhaps the working group referred to above) setting out the type of information which can be produced and the input requirements. This report might then be considered by a committee of the AVCC to determine whether further work should be carried out.

REPORT OF WORKING GROUP C

Information is needed for all decision making. Decisions require choices among alternatives even when the choice is dichotomous in nature. It is fundamental to the efficiency of the decision making process that the various alternatives be clearly understood. Information relevant to the alternatives should be available to the decision maker. The group discussed the various kinds of information needed to assist in the making of academic and administrative decisions. These, they felt, may be classified into the broad areas discussed by several speakers at the Conference. First, information about the goals of the institution, its responsibilities, both in a national system of tertiary education and in its own more local setting. Second, information about its outputs including the nature and effectiveness of the educational programs it provides, its scholarly activities and its services to the community. Three, information about the inputs required to achieve its outputs which include the budgetting of fiscal and other resources, admission of students, establishment and monitoring of academic programs and processes. Much of this information is hard in the sense that it is readily quantifiable and subject to statistical manipulation. However, some of the most critical items, for example, those relating to staff and student personnel matters, cannot be so acquired or handled. Both must be considered as essential to management's decision-making.

The group agreed that it is not possible to meet all needs for information by one management information system. Universities have many needs in common which could be met by systems to which all could be linked. However, there also are needs which are idiosyncratic to each university in that they are influenced by the university's specific goals and organisation. These call for systems internal to the institution itself. The group discussed various means by which universities have attempted to satisfy their unique internal needs and found one approach worthy of special attention. This has involved the establishment of a

reports or institutional research unit with staff and not line functions. Such units provide information gathering analysis and dissemination services to all subsectors of the university without supplanting other services which have autonomous responsibilities for regular information processing. For example, student admission, fiscal control and so on.

The group agreed that there were very significant advantages to be gained from sharing information both of the kind in which universities have a common interest and of the sort which may be more specific to our own institutions. Indeed considerable emphasis was placed upon the advantages to be gained in comparisons among universities; for example as a means of evaluating our own programs and procedures. Common languages are essential to meaningful sharing. Therefore the group supports efforts now under way to develop such communalities in the area of student statistics and believes that the work should be extended to cover information about staff, finances and facilities. The group was also quite aware of the constraints which definition can place on the expression of individual differences in programs and processes. Pressures also result from the aggregating of data from several sources. In other words, while a taxonomy is required if comparisons are to be made it also produces pressures toward homogeneity which may not be desirable. The group believes that this caution should always be kept in mind. The group also believes that significant gains can come from a study of the experiences of other nations with management information systems.

The group's discussions have led us to put the following suggestions to the Conference:

1. The AVCC in co-operation with other interested bodies, for example the Universities Commission, should take the initiative in exploring ways and means by which present management information systems available to universities can be improved. Current events in Australia, for example, interruption of the triennial budgetting, are introducing perturbations in university programs and processes which must be studied now.

2. This initiative should include, with high priority, co-ordinating the development of common languages and procedures for use in management information services which can be shared by all universities. The group believes that the current efforts of the Joint Committee on Computerisation of University Statistics are to be commended. It is suggested that these be extended beyond present concerns primarily with student statistics to include the development of common languages for analyses of statistics relating to staff, finances and facilities. The present Joint Committee might consider expanding its frame of reference to include staff matters. Other experts might be involved in the work on finances and facilities.

3. The AVCC should undertake the task of co-ordinating information about systems presently available in Australian universities. A systems exchange approach should be encouraged.

4. The group was concerned about the accessibility of management information once it is acquired. Ready access is essential if it is to be useful. It is suggested that the AVCC establish a working group to consider the matter of how information should be stored to maximise its accessibility to universities when it is needed and to minimise the lag with which it becomes available.

5. The group believes that steps should be taken to improve the usefulness of inter-university comparisons. Discussion at the Conference has indicated that this is a more complex matter than it might appear to be. It is suggested that it be subjected to a thorough and critical study.

6. It is suggested that the AVCC conduct a survey of what information is desired. As we noted earlier, we have the strong impression that there are a number of areas in which common interests exist. There also are matters about which concern is more limited, perhaps to a single institution only. A survey of common interest would be useful in setting priorities for the AVCC's efforts in the broad field of management information services.

SUMMARY OF DISCUSSION ON THE REPORTS OF THE WORKING GROUPS

Dr Lawrence indicated that he considered the proposals in the reports of the working groups appeared to represent a reasonable move ahead. He suggested the establishment of the proposed high-level policy committee was desirable because very important questions had to be answered. He indicated that the most immediate priority appeared to be in the further development of operational data systems, which could then be used to produce output for use in management information systems. Some co-operative development would be needed: either by sharing between institutions or appointment of some centralised staff.

In reply to a question Dr Lawrence indicated that the development of the data element dictionary and program classification structure was not a prerequisite for co-operative development of operational data systems but the general structure should be determined as early as possible. He indicated that one staff member at NCHEMS had spent a year to develop the initial data element dictionary in all six areas.

Mr Tate suggested that it may be advantageous to set up a systems exchange centre along the lines of the College And University System Exchange in U.S.A. Dr Lawrence indicated that there were only three staff at CAUSE. They specified standards for documentation for systems accepted, maintained the library of systems, met members' requests for systems and organised training programs.

Discussion took place on the extent Colleges of Advanced Education should be involved in any developments which might ensue from the Conference. Dr Lawrence indicated that the work of NCHEMS had enabled the States to undertake extensive comparative analysis between a major research university and a community college. As a result work was now proceeding on developing indicators in the information exchange project which would reflect the difference in mission, role and scope of institutions. He considered that this

was important if diversities in higher education were to be maintained. It was considered that comparative analyses would be made between universities and colleges, particularly if the Tertiary Education Commission came into being, and so emphasis should be placed on developing measures which reveal diversity. It was noted that four representatives of the colleges had been invited to the Conference and a report of proceedings would be available to the Conference of Principals.

Mr Tate observed that none of the groups recommended the setting up of an Australian version of NCHEMS. He questioned whether sufficient progress would be made by the methods proposed. It was suggested that there might be a case for setting up a small unit on the lines of the non-teaching staff study group.

It was noted that each group had recommended more emphasis be placed on the role of the joint committee on computerisation of university statistics in the development of standards such as the data element dictionary and program classification structure. It was suggested that the word "computerisation" should be deleted from the name of the committee as at present it is envisaged that only student data would be computerised. Mr Arthur pointed out that at present the Committee was operating on resources put in by the Universities Commission, namely $5000 to employ a consultant, Mr Barry Smith. He considered that the Committee would need to spend a lot of time in discussion. There was general agreement that the universities ought to be prepared to make available resources, mainly time of relevant staff, and that financial support should be sought from the AVCC.

Dr Lawrence suggested that the AVCC might wish to seek financial assistance from one or more foundations. The Ford Foundation had made grants available to the O.C.E.D., Brazil and Nigeria for work in the administrative management of higher education.

In summing up Professor Willett stated that he considered that the Conference had been effective, and useful discussion had taken place on an important topic. As well as the discussion on 'hard' information, he considered that there had been valuable discussion on 'soft' information, i.e. the context and the politics associated with higher education management information. Dr Lawrence had given valuable insight into this, particularly in his observations as to the impact NCHEMS has had in U.S.A. Professor Willett considered that we lack in the Australian higher education scheme much intelligence gathering such as the pattern of developments overseas. One of the questions that might be put to any committee set up would be how digested information about what is happening elsewhere might be disseminated.

RECOMMENDATIONS MADE BY THE CONFERENCE

1. That the Australian Vice-Chancellors' Committee, in co-operation with other interested bodies such as the Universities Commission, should take the initiative in exploring ways and means by which present management information systems available to universities can be improved. It is suggested that the AVCC should set up a steering (policy) committee or use the present Research Committee of which Professor Russell is convenor. This would include an evaluation of the applicability for Australian universities of the NCHEMS products such as the Resources Requirements Production Model, the Information Exchange Procedures and the Academic Unit Planning Manual.

2. That the terms of reference of the Joint Committee on Computerisation of University Statistics be widened to include the development of data element dictionaries for all operational areas (students, staff, finance, library, facilities) and of a program classification structure. The word "computerisation" might then be deleted from the name of the Committee. Some additions to the membership of this committee would be needed when different areas are being considered. It is recommended that the AVCC should provide some financial assistance to the Committee and the universities should provide time of relevant staff members to enable work to progress at a faster rate.

3. That the AVCC should undertake the task of co-ordinating information to facilitate the exchange of computerised operational data systems such as payroll, student records, library circulation. This would include developing some standards of documentation and considering the work of the College And University Systems Exchange operating in U.S.A. Two ways of proceeding could be to organise a meeting of specialists such as ADP Managers or other relevant staff and to arrange for surveys to be undertaken such as the one completed by Mr Findlay for this Conference.

LIST OF PERSONS ATTENDING

University of Adelaide

Professor K.A. Provins	Deputy Vice-Chancellor
Mr A.E. Shields	Registrar

Australian National University

Professor D.N.F. Dunbar	Deputy Vice-Chancellor
Mr W.C. Fairbanks	Budget Officer

The Flinders University of South Australia

Professor R.W. Russell	Vice-Chancellor
Mr D.B. Leadbetter	Assistant Registrar

Griffith University

Professor F.J. Willett	Vice-Chancellor
Mr J. Topley	Registrar
Mr J.A. Nelson	Principal Administrative Officer

James Cook University of North Queensland

Mr K.N. Chester	Registrar
Mr G.M. Addison	Bursar

La Trobe University

Mr R.C. Christie	Business Manager
Mr M.D. Kellock	Assistant Registrar

Macquarie University

Professor E.C. Webb	Vice-Chancellor designate
Mr A.J.T. Ford	Registrar
Mr A.W. Findlay	Deputy Registrar
Mr D.E. Ritchens	Manager, ADP

University of Melbourne

Mr R. Marginson	Vice-Principal
Mr I.R. Barrah	Deputy Registrar
Mr W.F. Wood	Controller, Management Information
Mr N. Stubbs	Statistical Officer
Mr P.R. Masters	Senior Lecturer, Business Administration

Monash University

Professor K.C. Westfold	Dean, Faculty of Science
Mr I.B. Tate	Deputy Comptroller
Mr M. Butler	Manager, ADP

Murdoch University

Professor A. Beacham	Deputy Vice-Chancellor
Mr B.J. Cosgrove	Assistant Secretary (Planning)

University of Newcastle

Professor A.D. Tweedie	Deputy Vice-Chancellor
Mr L.W. Harris	Bursar

University of New England

Mr D.C. Williams	Academic Secretary
Mr I. Droop	Manager, ADP

University of New South Wales

Professor R.E. Vowels	Pro-Vice-Chancellor
Mr T.J. Daly	Bursar

University of Queensland

Mr J.E. Ritchie	Deputy Vice-Chancellor
Dr S.A. Rayner	Registrar

University of Sydney

Professor B.R. Williams	Vice-Chancellor
Mr H.G. McCredie	Deputy Principal
Mr K.L. Jennings	Assistant Principal
Mr S. Harrison	Statistics Officer

University of Tasmania

Professor C.P. Wendell-Smith	Pro-Vice-Chancellor
Mr B.J. Wallace	Officer-in-Charge, Administrative Section

University of Western Australia

Professor A.J.F. Boyle	Deputy Vice-Chancellor
Mr W.G. Nation	Planning Officer

University of Wollongong

Professor A. Keane	Deputy Vice-Chancellor
Mr B.J. Meek	Bursar

Universities Commission

Professor P. Karmel	Chairman
Mr R.H. Arthur	Assistant Secretary

Australian Vice-Chancellors' Committee

Mr D.L. Purnell	Assistant Secretary

Tasmanian College of Advanced Education

Mr J.I. Owen	Acting Vice-Principal

State College of Victoria

Mr D. Shaw	Assistant Registrar (Research and Planning)

Mitchell College of Advanced Education

Mr G. Rowe	Assistant Secretary

Torrens College of Advanced Education

Dr J. Skull	Deputy Director

National Center for Higher Education Management Systems (U.S.A.)

Dr B. Lawrence	Director

PROGRAM

Saturday 29 November 1975

11.30 am	Delegates arrive at Dunmore Lang College
12.30 pm	Lunch
2.00 pm	Opening remarks by the Chairman for the Conference, Professor John Willett, Vice-Chancellor, Griffith University
2.15 pm	A Vice-Chancellor's Needs for Management Information Services - paper by Professor Roger Russell, Vice-Chancellor, Flinders University, followed by discussion
3.00 pm	The Needs of a Science Dean for Information - paper by Professor Kevin Westfold, Dean, Faculty of Science, Monash University, followed by discussion
3.45 pm	Tea break
4.05 pm	The Perceived Needs for Management Information Services from the point of view of a University Administrator - paper by Mr Ray Marginson, Vice-Principal, University of Melbourne, followed by discussion
4.50 pm	Discussion by Working Groups
6.45 pm	Pre-dinner drinks
7.30 pm	Formal Dinner

Sunday 30 November 1975

8.00 am	Breakfast
9.30 am	The Role of the Systems Manager - paper by Mr Peter Masters, Senior Lecturer, Graduate School of Business, University of Melbourne, followed by discussion
10.15 am	Tea break
10.35 am	The Current Role of a D.P. Systems Manager - paper by Mr Des Ritchens, Manager, A.D.P. Unit, Macquarie University, followed by discussion
11.20 am	Further discussion by Working Groups
1.00 pm	Lunch
2.00 pm	The External Demands for Information and the Effect on Universities - papers by Professor Peter Karmel, Chairman, Universities Commission, and Professor Bruce Williams, Vice-Chancellor, University of Sydney
3.30 pm	Tea break
3.50 pm	Discussion of the above two papers
5.00 pm	Further discussion by Working Groups
6.30 pm	Informal dinner

Monday 1 December 1975

8.00 am	Breakfast
9.00 am	Information and Analysis in Higher Education Planning and Decision Making in the United States - 1975 - paper by Dr Ben Lawrence, Director of the National Center for Higher Education Management Systems, W.I.C.H.E., U.S.A., followed by discussion
10.25 am	Tea break
10.45 am	Survey of Management Information Systems in Australian Universities 1975 - report on results of questionnaire on management information systems by Mr Bill Findlay, Deputy Registrar, Macquarie University, followed by discussion
11.30 am	Reports from the three working groups and discussions of any recommendations for further action
12.45 pm	Closing remarks by the Chairman
1.00 pm	Lunch